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THE NEW UNITED STATES CRUISERS.

Of the four cruisers now being built for the government, one, the Atlanta, was described and illustrated in the SCIENTIFIC AMERICAN of November 17, 1883; the Boston is identical in every respect to the Atlanta. In regard to size these two vessels are between the Dolphin and Chicago, which are described and illustrated in the present issue.

U. S. DISPATCH BOAT DOLPHIN.

The governing condition in the design of the Dolphin has been high speed capable of being maintained for several days. It is intended for a dispatch boat for furnishing rapid communication from the seat of government to any point on the coast, or to act as fleet dispatch boat if a United States squadron should need its services. In designing it all attempt at protection was abandoned, and machinery of the most durable and efficient type adopted.

The principal features of the Dolphin, represented in the engraving upon this page, are:

Length between perpendiculars	240 feet.
Length, extreme	256·5 "
Breadth, moulded	31·85 "
Breadth, extreme	32 "
Depth from top of floors to top of main deck beams	18·25 "
Depth from base line to top of main deck beams	20·07 "
Top of main deck at side above load water line	6·28 "
Mean draught	14·25 "
Displacement at mean draught	1,485 tons.
Complement of men	80
Battery—One 6-inch pivot, four revolving cannon.	
Indicated horse power	2,300
Speed	15 knots.
Capacity of coal bunkers	310 tons.

It will have a flush open spar deck, with no poop cabin or forecastle. Near the cabin gangway will be a small central deck house, and, with the exception of another around the boiler and engine hatches, the deck will be uninterrupted fore and aft. The armament will consist of one 6-inch B. L. R. mounted upon a shifting pivot forward of the fire bridge, and four 47 mm. Hotchkiss revolving cannons, mounted at the end of each bridge in fixed armored towers. It will have a three masted schooner rig with small and light spars and no head gear. The plan shows that the structural arrangements will be similar to those of merchant vessels, except that care has been taken to divide the hull into six water-tight compartments by transverse bulkheads extending to the upper deck. Greater longitudinal strength than usual has been provided for. The bow will be strong and slightly ram-shaped. It will have a steam steering engine, will be lighted by electricity, and will have electric search lights and head lights. The ventilation will be as perfect as it is possible to make it.

A two cylinder compound vertical direct acting engine of 2,300 indicated horse power will actuate the single screw. There will be one high pressure cylinder 42 inches in diameter and one low pressure 78 inches in diameter, the stroke being 48 inches. The cylinders are to be placed immediately over the crank shaft, each being supported by two wrought iron columns secured to the bed plate of the engine, and by two cast iron brackets attached to the condenser and also forming the cross head guides. The valves and levers for working and regulating the engines will be operated from the starboard side of a gallery running around the engines on a level with the berth deck. An upper gallery will be on a level with the spar deck. The propeller will have four adjustable blades 14 feet 3 inches in diameter with a mean pitch of 21 feet 4 inches.

Cylindrical boilers will be used with a pressure of 100 pounds per square inch above the atmosphere. The grate surface will aggregate 270 square feet, and the heating surface 6,600 square feet. They will have internal cylindrical furnaces and horizontal fire tubes returning above the furnaces. There will be two single end boilers having a length of 9 feet 6 inches and a diameter of 11 feet, and each furnished with two furnaces. There will also be two double end boilers with a length of 18 feet 3 inches, and a diameter of 11 feet, each having four furnaces. The longitudinal axes of the boilers will be placed in a fore and aft direction, the single end boilers aft facing the double end, the fire room between them being 9 feet 6 inches. At the other end of the double end boilers will be a fire space 9 feet long. The fire room hatches and other openings can be closed air-tight.

The contract price for the hull, machinery, and fittings of the Dolphin, exclusive of the masts, spars, rigging, sails, boats, etc., was $315,000.

U. S. TWIN SCREW STEAM CRUISER CHICAGO.

Length between perpendiculars	315 ft.
Length on water line	325 ft.
Length over all	334 ft. 4 in.
Depth, garboard strake to under side of spar deck	34 ft. 9 in.
Height of gun deck port sill from load water line	10 ft.
Height of spar deck port sill from load water line	18 ft. 6 in.
Breadth, extreme	48 ft. 2½ in.
Draught of water at load line, mean	19 ft.
Displacement	4,500 tons.
Area of plain sail	14,880 sq. ft.
Complement of men	300
Battery, four 8-inch long breech loaders in half turrets, eight 6-inch and two 5-inch on gun deck.	
Indicated horse power	5,000
Sea speed	14 knots.
Capacity of coal bunkers	940 tons.

This vessel, represented in the engraving on page 390, will be built throughout of mild steel, with no wood sheathing. It will be divided into ten water-tight compartments by nine transverse bulkheads extending to the gun deck. The boilers and machinery are to be in the four amidship com-

(*Continued on page 391.*)

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IRRIGATION IN CALIFORNIA.

In 1871 the crops in the valley of the San Joaquin River, California, from a long drouth and severe north winds, were threatened with entire destruction. Some of the farmers then hurriedly cut a few ditches from the King River, and the flooding they thus obtained made the wheat yield from 30 to 55 bushels per acre, and land which had previously been hard to sell at $2.50 per acre rose in value to $25 and $30. From that time to this the system of regularly managed irrigation has steadily grown in all that valley section, lying about 200 miles southeast of San Francisco. There are now six companies organized for this purpose, with an estimated capacity to furnish water for the irrigation of about 650 square miles, although past experience tends to show that, after the system of irrigation has been once established, the water supplied will go further and probably make cultivable a much larger area. The farmers buy their water rights from the companies at the price of $10 an acre, for which they can take as much water as the area of ground requires, and draw at any time and as often as they choose. They have to make their own laterals, which are usually ditches four feet wide by one deep, and can be made cheaply by plow and scoop. Since this system of irrigation has been adopted, many thousands of acres of land, theretofore almost barren, have been turned into some of the most productive farms on the Pacific coast, and are especially valuable for the raising of grapes and other fruit.

IMITATIONS OF COSTLY LEATHER.

The custom of carrying lunch reticules, money purses, and traveling bags of leather has made an increased demand for the leather from rare animals, or for leather of attractive appearance. As the natural supply of alligator and the great python or boa skins is not sufficient to keep up with the demand, these skins—or the leathers from them—are imitated very largely by using the leather of commoner and cheaper skins. Even seal leather, goat leather, and kid leather, or morocco, are imitated. The surface of alligator leather consists of almost exact rectangles or squares, separated by deep furrows, the squares gradually diminishing in size as they recede from the center of the skin. The boa leather is in diamond shaped patches, forming a fine network, and is very elegant, the division lines being very fine. Sealskin leather is a fine diapered or arabesque pattern of irregular divisions raised and depressed. Goat leather is crossed in regular lines at acute angles, forming minute elongated diamonds.

As some of these leathers are too costly to be furnished at low prices, the million who desire the best, but cannot always afford the cost, are supplied by fair imitations which are not as durable as the genuine, serving in part the purposes of the costly leathers. These imitations are made by the aid of photography. A genuine seal, alligator, boa, or other costly skin is photographed, then printed on sensitive gelatine, the parts not acted upon by light dissolved out in water, and a cast or an electrotype plate then made in copper or type metal, as practiced in the reproduction of engravings, and then the metal plate and the smooth leather of some domestic animal are passed between rollers under pressure, and the figure on the plate is permanently fixed on the leather by great pressure. Any of these leathers may be stained, colored, or dyed to any tint desired; but plain black or the color left by the tannin is generally preferred.

THE CHINCH-BUG IN NEW YORK.

Dr. Lintner, Entomologist of the State of New York, has recently issued a bulletin stating that the much dreaded chinch-bug, which has caused so much destruction to the crops in the West, is present in alarming numbers in some parts of New York. We are pleased to note the commendable enterprise of Dr. Lintner in warning the Eastern farmers of their danger. The pest has been discovered in St. Lawrence County, and the State Entomologist desires every farmer in that part of the State to examine his meadows for patches of dead grass, which look as if winter killed. If such places are found and the bugs discovered, it is recommended to scatter straw over these dying patches, and afterward burn it. This work must be done with great care, and a favoring wind is important. The burned area should afterward be deeply plowed, and not in ridges. To the more effectually bury the chinch-bugs, the plowed land may be harrowed. If the meadow will not permit of being plowed, the next best thing is to apply gas-lime at the rate of two hundred bushels per acre. The gas-lime may be applied at any time during the coming winter, but, of course, the plowing must be done before the ground freezes and prevents the sod being turned.

A more widespread attack of the chinch-bug may be looked for next June, when it will be time to use other means of destroying this enemy to our grass and grain crops.

Professor Riley, the Government Entomologist, in the last issue of *Science*, states that he thinks that Dr. Lintner is wrong in his opinion that the chinch-bug was brought in a freight car from the West. Fitche's record of having found this bug in northern New York leads to the belief that it has long been in the East, and the present outbreak is due to an increase in numbers from some favoring condition instead of an invasion. However this may be, the importance of taking all precautionary measures remains the same. A bug which will destroy millions of dollars' worth of crops in a single State, as it has done in Illinois and elsewhere, is one not to be desired.

ADULTERATIONS OF FOODS—GLUCOSE IN SUGAR AND IN SIRUPS.

The fact is so well known as to be admitted by all, that a considerable part of the articles which we consume for food and for drink are open to the belief that "things are not what they seem." Meat and fish cannot very well be imitated, and we probably buy real beef, and veal, and chickens, and codfish, and halibut, though they certainly may be all of them so wonderfully fitted up for the purposes of sale as to impose on the purchaser sadly. But butter, and sugar, and coffee, and tea, and vinegar, and spices of every sort, we purchase in a state of purity in only exceptional cases. Wherever an imitation can be made that costs less money than the article which is the original, we may be sure that on an average our chance is good for getting the counterfeit.

We are apt to think that if we select a grade of high price in any special line, we are sure of getting what we profess to get, and perhaps it is a good plan to lay that flattering unction to our souls, for we feel better after it; but the simple fact is, that in general the higher the cost the better the adulteration pays, and as human nature is open to influences, the larger money brings us a more elegant style of imitation only.

Inasmuch, then, as the admixtures are so very common, it becomes for us a question of almost vital interest to know whether they are injurious to health, or whether they are harmless. If we barely lose our money, because we do not get what we think we do, that is bad enough; but if, on the other hand, we are at the same time poisoning or at least injuring ourselves and our families, the case assumes a very different aspect.

Our attention has been recently called to one form of adulteration which is so exceedingly common that we cannot go a single day free from it. We allude to the presence of glucose in sugars and in sirups, and we take up the subject in the hope that we may dispel some groundless fears. That the glucose is there is as sure as the sun rises daily. There may be *some* sugars and sirups that are pure and honest, but there are many which are not. We are not speaking at random in this, we are only testifying to what we know by experiment. We have purchased sample lots, here and there, in New York and in other places, taking care to get them only from dealers where we were likely to get our articles of as good quality as could be found. Chemical trial showed in almost every instance the presence of glucose.

An apothecary submitted to our examination a sample of sugar from a lot he had just purchased for his pharmaceutical use, which had been recommended to him as absolutely pure; it showed over *five per cent of glucose!* We have seen barrels opened, found the maker's guarantee of perfect purity lying under the barrel-head, taken samples from directly beneath the printed falsehood, and found them rich in glucose!

We do not, therefore, dispute the presence of the admixture, but it is a perfectly harmless substance and need never cause alarm to any one. This is what we meant by saying that we hoped we might allay groundless fears. We may eat and drink glucose all our lives, our children may take it down *ad lib.* in their candy, as they are doing every day, we may have our delicious maple sirup on our buckwheat cakes, and they will not hurt us any more than the cakes are bound to any way; we may revel in glucose, and live and die happy.

Let us look at it chemically. There are, as natural products, two forms of sugar everywhere diffused; they are known as cane sugar, and grape sugar. Taken as a rule, it may be said that cane sugar exists mostly in the sap or juices of plants, and grape sugar in the fruits, though there are many interchanging exceptions. They are composed of carbon, oxygen and hydrogen, the proportions being in cane sugar $C_{12} H_{22} O_{11}$, and in grape sugar $C_{12} H_{12} O_6$. They are both harmless and nutritious to the human system; they are both sweet, the sweetness of grape to cane being about as one to two. Chemically, cane sugar is a saccharose, and grape sugar is a glucose, the latter retaining this as a market name.

What we buy as *sugar* professes always to be cane sugar, made hitherto almost exclusively from the sugar cane. If now our grape sugar or glucose had been a natural product, say from fruits, there would probably never have arisen the prejudice against it which now exists. But it is not so; it is altogether a factitious article, and few people are sufficiently familiar with chemical principles to realize at once its real nature. All the glucose and grape sugar in the market is made by the action of sulphuric acid (oil of vitriol) on some vegetable material. In this country starch is used chiefly, as being the cheapest and most convenient, but linen rags are equally serviceable and produce an equally pure and excellent *sugar*.

That is one of the wonders of chemical combination—as much a wonder to the most thorough chemist as to any one else. He sees the work grow under his fingers, and what is done he does not know; he knows nothing but the result. He boils starch with sulphuric acid and water. The mixture instead of being very sour is sweet to a certain extent, that is to say, sugar is there, but the acid is also there, for the acid has changed the starch to sugar and yet has itself not been affected in the least. He throws in powdered chalk, which unites with the acid and settling to the bottom leaves a beautiful, clear, sweet solution of *grape sugar*.

The acid is gone, the starch is gone, and pure, harmless

sugar remains. No one need fear it because oil of vitriol by magical catalysis compelled the starch from being $C_{12}H_{20}O_{10}$ to become $C_{12}H_{12}O_6$; that is, to lose four atoms of water (which is H_2O) from its composition and become glucose.

No, no! It is true, when we start to buy sugar we naturally would be glad to get what we had in mind; but if adulterations were no worse than this, we well might think little of them.

"FISH CULTURE FOR PROFIT."

In our paper of September 1 we printed a communication headed "Fish Ponds for Farms," and we wish to add to it here some items which we hope may make it of more direct and immediate value, as bringing it within the range of more speedy returns for the money and labor invested. We have selected the title above given, because any one can turn to the *Bulletin* of the United States Fish Commission, for 1881, page 382, and see that we are not talking at random. "Fish Culture for Profit" is discussed there by authority.

We have long had the belief that the worthless swamp lands, found along so many of the brooks and streams, throughout the country, might be made, by means of an outlay which would be almost nominal, to pay a more certain and a greater return annually, than any parts of the same farms devoted to corn, grain, or hay, counting acre for acre, so that Mr. Hiester's article in the *Bulletin* interested us greatly, and our correspondent of September 1 gives us occasion for calling the subject up here.

The fish to which so much attention has been given of late years for pond growth we must set aside, every one of them. Trout have had the greatest name of all, but in the waters which we propose to utilize they will never thrive, in fact can scarcely be made to live at all. They must have either a running stream or a pond which is fed with clear cold water. They bring, it is true, a fine price, but they are very delicate, subject to many vicissitudes, and they require constant care, and much attention to their supply of food.

Black bass, yellow perch, and pickerel have all been used for stocking ponds, and with more or less of success, but they are all such voracious brutes that they speedily clear the water of every living thing that can swim, including even their own young, and the consequence is that only a very limited supply can be secured from a given amount of space. Their remarkably healthy appetites ruin them for profit.

German carp have been now extensively introduced, and their value is beyond question very great. We have nothing to say against them, and they will doubtless retain a strong hold on popular favor, for they deserve it. But we have that which is decidedly to be preferred, when we are looking for *profit*. The carp grow to a fine size, and it is a grand sight to watch them cruising about on a warm summer's day, in a pond—great fellows, six, eight, ten pounds and more, close to the surface, dorsal fin perhaps out of water. No, we have no charge against the carp, and we are almost ashamed and afraid to bring up our little protege in comparison. But then it is the dollars for which we are looking, and we propose to show how a swamp meadow can turn out more money to the acre from *bull heads* than the same space will readily pay in any other manner, wet or dry.

The fish to which we refer is the *Amiurus nebulosus*, and is called bull head, horned pout, and, in some parts of New England, minister. It is a catfish. There are many American species of catfish, but this is the only one common in the regions of New York and New England; and it is a fact worthy of note that though we have nine or ten species of *Amiurus*, the only type of the genus which is found beyond the limits of North America is more closely allied to the *nebulosus* than any one in our own waters; it is the *A. cantonensis*, a native of China.

The horned pout is never a large fish, one weighing a pound being much over the average, and in raising them for the market they will afford the greatest profit when not exceeding half a pound. The advantages which they afford over the other fish mentioned, for remunerative cultivation, are that they are perfectly hardy, not liable to disease, thrive to the best advantage in sluggish and warm waters, need no care or feeding, live on aquatic plants and insects, and can thus secure abundant food from a small space, multiply rapidly, and are ready for market at the age of a year, which is much earlier than any other fish.

The demand for them, a small pan fish without bones, is almost unlimited and the price good. Mr. Hiester quotes them as selling by the ton at ten cents a pound. His estimate is that ten feet square of pond area will yield annually over ten pounds of fish. On these data, an acre will return $420 dollars at the least. This seems too great for belief, and yet he assures us that it is done; a half or even a quarter of it would satisfy most land owners, especially as the land needed and taken for this purpose is that part of the farm which for other uses is without value.

The preparation of the pond involves very small expense, for it is best that the water should be shallow, not over four or five feet deep. In most cases a spot can be selected where a dam of but a few rods in length across one of our swamp streams will be sufficient to overflow from one to two acres to the depth required. The only expense beyond building the dam is to so far smooth the bottom that a net can be dragged over it. The removal of bushes and rocks, and perhaps a little work with plow and scraper, will do this, and the pond is ready for stocking. It is easy to procure the catfish in most localities, and nothing further is required. That acre of swamp land was before this worth practically *nothing;* it might perhaps yield a nominal amount of pasturage. It is best to leave it two years, so as to allow the fish to increase and grow. After that time they can be taken out at convenience. A net should be used which allows the small ones to pass through. None under five inches (preferably six) should be caught, and it is wise always to retain in the pond a good proportion of full grown fish, for the sake of more rapid increase in numbers. The fish can readily be taken at such times as to scarcely interfere at all with the labor of the farm. They can be sent to market as they are caught, or they can be skinned and packed in boxes ready for use, according to what the sale demands.

Every other acre of the farmer's land which yields him a crop involves the expense of fertilizers and labor, for weeks and months. This acre of pond surface on worthlesss swamp land costs not a dollar of expense annually beyond that of drawing the net and preparing the fish for market, and on the faith of the *Bulletin's* estimates it will yield $400 and upward. What part of his fertile land will pay as well?

DIPTEROUS LARVÆ IN THE HUMAN BODY.

BY PROF. C. V. RILEY.

Several papers on this interesting subject have recently been published by American and European authors, partly from the entomological standpoint. De Franz Loew, in a paper on myiasis and its originators (in Dr. Wittelshoefer's Wiener Mediz. Wochenschr., vol. xxxiii, pp. 972-975, 1883) corroborates by further testimony his views expressed in a former article, viz., that the disease known as myiasis is caused not by larvæ of Œstridæ, as has been and is still so frequently assumed, but solely by species belonging to the "flesh flies" (Sarcophagidæ and Muscidæ). In fact, so far as reliable observations and determinations have been made there are but two species concerned, viz., *Sarcophila wohlfarti* Portsch (= *magnifica* Schin.) in Europe, and *Compsomyia macellaria* Fabr. in America. The latter species is distributed throughout North and South America, and has an extensive synonymy, as not only the *Calliphora anthropophaga*, Couil, *C. infesta* Philippi, and *Lucilia hominivorax* Coquerel, but no less than 23 other "species" have proved to be synonymous. On the synonymy and on the geographical distribution of *C. macellaria* two papers were published some time since by E. L. Arribalzaga (in Anu. Soc. Cientif. Argentina, vol. vii., p 253, 1879; and vol. x., p 248, 1880), but M. F. Bigot, the well known French dipterist, hesitates to accept the synonymy (Ann. Soc. Ent., France, 1883, Bull., p. cliv.), and further thinks that myiasis in America may also be caused by other species of Lucilia and Pyrellia.

Attacks on man by Œstridæ are of very rare occurrence. There are but three well authenticated cases known caused by hypoderma, two in Europe and one in this country,* while a few others have been caused by *dermatobia*, all in the tropics. Quite recently Dr. Laboulbène (Ann. Soc. Ent. France, 1883, Bull., p. cxxvi.) observed a case in France caused by *Dermatobia noxialis*, but this was imported from Brazil by the person infested with the larva. Œstrid larvæ in man are always found singly in various parts of the body under the skin, which may otherwise be in a healthy condition. Moreover, Œstridæ, which, like gastrophilus and œstrus, infest internal organs, are never known to attack man. The occurrence of œstrid larvæ under the human skin must be looked upon as accidental, and the celebrated "*Œstrus hominus*" as a myth. The removal of the larva is neither difficult nor attended by any serious consequences.†

The larvæ of flesh flies, on the other hand, always occur in large numbers, and only in diseased or injured places in the skin or mucous membrane. The parent fly is attracted to such places, and especially to sores. Thus persons suffering with ozæna are liable to be affected with myiasis; and as the flies oviposit during the daytime, the disease has, with few exceptions, been observed in persons who have slept outdoors during the day in summer.

IMPOVERISHMENT OF LAND.

M. Deherain, in his interesting discourses upon the exhaustion of the soil by cultivation, makes some statements that are striking and suggestive.

In speaking of the evaporation of water from the leaves of plants, he says that in one hour, exposed to the sun, a leaf of barley exhales a weight of water equal to its own; and calculating upon these figures, a hectare (2·5 English acres) of maize will lose, under the same circumstances, 25 cubic meters of water. Hales, an English observer, has said that a hectare (2·5 English acres) of cabbages loses each day 20 cubic meters of water, and Lawes and Gilbert, in their studies on this subject, proved that a plant which has formed one kilogramme of substance within itself has carried in circulation through its tissues 250 to 300 kilogrammes of water.

Humus or decayed vegetable matter is the body which is most efficacious in retaining and keeping in a pure state the terrestrial waters. It can absorb an amount of water greater than its own weight, holds it more tenaciously than clay and infinitely better than sand. Analyses show that humus abounds in the prairies, or unused lands, and that it diminishes greatly in cultivated districts. M. Boussingault found in a pasturage of Argentan, in a kilogramme of soil, 40 grammes of carbon belonging to organic matters, and only 28 and 24 in the same quantity of cultivated land. M. Truchot found 10, 12, 14, 18 grammes of carbon in the districts of Limagne and Auvergne, which were highly cultivated, while he reports 110, 120, 148 grammes in the prairie lands of the high mountains which were roamed over by cattle, but never received fertilizers. The reasons for this difference are not difficult to determine. In the unused fields the earth is not broken up or exposed to the oxidizing and destructive action of the air, and the decaying roots, sprays, and scapes of the grass or herbs constantly increase or maintain unchanged its percentage of humus.

M. Deherain has demonstrated the cause of this loss. He divided his experimental land into parcels, and devoted many of them to a continuous cultivation. Some from 1875 to 1879 have borne potatoes, others corn, others each year beets. In 1878 the land planted with maize, in one kilogramme contained 16, 15, 13 grammes of carbon; at the end of 1879, 18 months later, the same weight of soil gave 14·4, 10·4, 13·1, 12·3, and at the end of 1881 the amount had been reduced to 8·0, 7·6, 6·1 grammes of carbon per kilogramme of soil.

In 1879 he examined the land planted with beets and corn, having yielded three harvests of beets and one of corn, and found the quantity of organic substances oscillating around 13 grammes per kilogramme. He then sowed this ground with sainfoin, which remained undisturbed for three years, and yielded excellent crops. At the end of the experiment he found the amount of carbon per kilogramme of soil had scarcely changed, being in fact 11·4, 13·0, 13·3, 12·8, 12·1, or a mean of 12·5, contrasting to great advantage with the reduced amounts in the harrowed and turned up grounds.

Apart from the reduction of organic matter in soils upon being turned up, the oxidation which removes the organic matter M. Deherain attributes to chemical change, by contact with air and to fermentation, but also largely to the activity of living organisms, plants and animals; for he observes, "The soil is not simply a mass, porous and inert, of clay, sand, and humus, but rather a center of organic activity."

Although MM. Schlœsing and Muntz have shown that the formation of carbonic anhydride goes on in a sterilized soil, it is yet probable that microscopic germs and other living occupants of the earth are the principal agents in its production ordinarily.

These inferior beings play an important role, and MM. Lawes, Gilbert, and Warrington have shown that the mushrooms, which at some seasons appear in such numbers, decompose and assimilate large quantities of the organic contents of soils. The well known "fairy circles" in fields are due to a luxuriant growth of grass following the disappearance of the mushrooms, which first formed them. These chemists found that outside of these circles the ground contained 3·30 per cent of combined carbon, while within, and after the occupancy of the space by these parasites, the samples yielded 2·78 per cent. This difference corresponds to almost 9,000 kilogrammes of carbon to 1 hectare (2·5 English acres) of land!

The Locomotive Whistle.

We have given a number of statements from observers who certify to hearing the whistle for distances of over 15 miles. Here are others: Mr. J. J. Stranahan states that the whistle and the noise of the train on the trestle at Erie were formerly heard at Boeuff, Pa., a distance of 19 miles, air line.—W. J. McC., of San Pablo, Cal., writes that on calm, clear days, especially in the fall, they hear the rumble of the cars on a trestle located 18 miles distant.—J. H. S. says he has frequently heard the railway shop whistle at Grand Island, while living at Orville, a distance of 28 miles, and has seen moving trains with the unaided eye 12 miles. —Mr. C. V. Swarthout, Cape Vincent, N. Y., frequently hears the railway whistle at Kingston, Ont., 18 to 20 miles, also the rumbling of the trains; also musketry firing at Fort Henry, same place, while the sound of the cannon fired there sometimes is so strong as to shake his house.

Aniline Dye Adulterated with Sugar.

In a paper read at the November meeting of the Dublin Scientific Social Club, Mr. H. C. Draper said that a sample of magenta dye, purchased from an English firm, was found to contain crystalline matter insoluble in alcohol. The writer, on examination of the bulk of the dye, found that, mixed with the characteristic crystals of rosaniline chloride, was a large number of small cubes of a darker color. These, on further examination, proved to be crystals of *sugar* "faced" with roseine, and many of them so slightly coated that the dye was easily removed by rubbing them with the fingers. As the sugar crystals could be readily distinguished by inspection, they were picked out by hand from a weighed quantity of 10 grammes, and it was found that they amounted to no less than 95 per cent of the whole. A fresh quantity of 10 grammes of the dye exhausted with absolute alcohol left a sugar residue equal to 59·5 per cent.

It would be interesting to know to what extent this somewhat ingenious form of adulteration is carried.

A Steam Magnet.

C. Thouvenot, as did previously Tommasi, obtains an electro-magnet by passing steam of the pressure of two atmospheres through a copper tube of 1·5 millimeters in diameter coiled round an iron core.—*Weidemann's Beiblätter.*

* C. H. Allen, in Proc. A. A. A. S., Detroit meeting, vol. xxiv., p. 290.

† See Dr. J. L. Le Conte's remarks in his edition of Say's writings, vol. ii., pp. 37-38.

THE "HERCULES" BONE MILL.

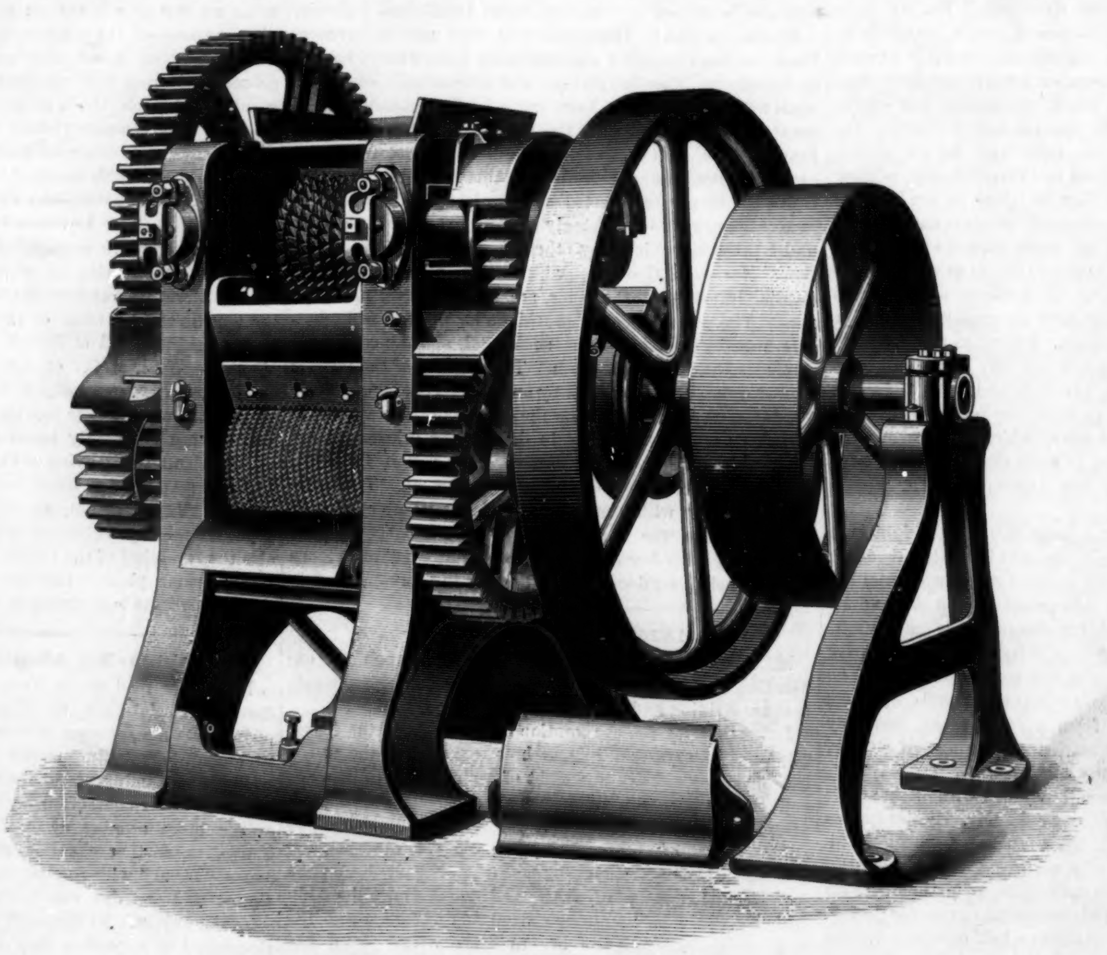
Messrs. Nicholson, of Trent Iron Works, Newark-on-Trent, designed and are manufacturing the "Hercules" mill, of which we give a perspective view from *Iron*. There are two classes of these mills made, viz., one in which only one pair of rollers is used, and another in which two pairs are employed.

The mills fitted with one pair of rollers will reduce raw bones to three-quarter inch, five-eighths inch, and one-half inch pieces, and making comparatively very little dust.

The more complete mills, with two pairs of rollers and concaves, will grind to any degree of fineness from one-half inch pieces down to bone dust, or by shutting off the lower pairs of rollers by the use of a single slide, can be made to produce a similar sample to the mills with a single pair of rollers. The rollers are composed of case hardened disks of tough annealed crucible cast steel, bolted together; the additional precaution has been taken of securely interlocking them—a most important provision. Should, therefore, one of the disks on either side of it, and are not liable to fall out and be passed between the rollers, with the certainty of causing serious damage to them or the gearing. They are further protected from breakage caused by sudden strain, or by the introduction of hard foreign substances, by automatic safety appliances, consisting of compressible boxed springs, which offer uniform resistance up to their ultimate compression. The concaves are similarly protected by a weighted lever, by means of which the pressure can be regulated and a coarser or finer sample of bone dust produced; or the concaves can be thrown altogether out of use.

"An additional safeguard is provided in the shape of a friction clutch on the main driving shaft. This is found of great service. Occasionally hard substances of large size are accidentally passed into the rollers, which it is impossible for them to avoid even when the safety springs are compressed to their full extent. The resistance then of the obstacle overcomes the resistance of the clutch, and the rollers remain idle and consequently uninjured, enabling the attendant to remove the source of danger at his leisure. All the rollers run at different velocities, so that a tearing as well as a crushing action is obtained, and they are rendered to a great extent self-cleaning. The lower pair of rollers deliver into and work against corresponding toothed adjustable concaves, which embrace the lower half of the periphery of one or both rollers, and by their action the bones are further reduced to a fair sample of bone dust at a single operation. These adjustable concaves also keep the fine rollers free from fatty or glutinous matter exuded from the crushed bones.

"For the upper rollers a series of efficient separate cleaners are provided. We had an opportunity of examining these mills at the late Royal Show at York, and can affirm that their construction throughout is of the most substantial character, and calculated to withstand without risk of breakage the sudden and severe strains so frequently fatal to ordinary bone mills, while the testimony of users places their efficiency at about double that of mills requiring the same driving power, but not possessing the same detail improvements. The spindles are of steel, as also is the main driving pinion. The side frames are each cast in one piece, and are securely braced together. On the driving shaft is fitted a pulley, up to 36 inches diameter, and a separate and heavy fly wheel. The bearings are of the best gun metal, with careful arrangements for lubrication. A strong floor bracket with pedestal is provided to carry the outer end of the driving shaft, as seen in our engraving."

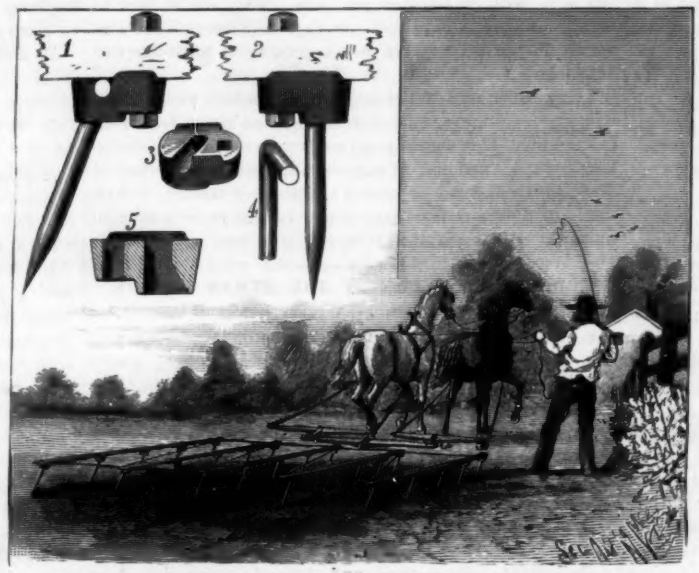


THE "HERCULES" BONE MILL.

GAS engines from ¼ horse power to 80 horse power are now made. Medium sized gas engines, say 16 horse power, will run on a consumption of fuel equal to 1½ pounds of coal per horse power per hour, which is about one-half the fuel required for the most economical steam engines of the largest size.

SOCKET FOR HARROW TEETH.

The harrow tooth is constructed with a right angled arm at its upper end, as shown in Fig. 4. The metal socket that carries the tooth is arranged on the under side of the bar, and has at one end a bolt hole, and is made with opposite side flanges on its upper surface to clip the bar on either side, and thereby assist in holding the socket to its place. Formed within the upper surface of the socket is a channel, which extends from the side of the socket to an aperture passing down through the socket, as indicated in Figs. 3 and 5, the latter figure being a vertical section through Fig. 2. The channel occupies an oblique position to the sides of the socket and length of the bar, and is of such size as to freely receive the arm of the tooth.



CARSTENSEN'S SOCKET FOR HARROW TEETH.

The aperture through which the shank of the tooth passes is of gradually increasing oblong shape, having one vertical side and one sloping side shown in Fig. 5. This construction enables the tooth to adjust itself either to a perpendicular or backwardly inclined position relatively to the beam. In Fig. 1 the draught is toward the right, and the shank of the tooth rests against the inclined side of the aperture; in Fig. 2 the draught is the same way, but as the position of the socket has been reversed the tooth bears against the vertical side. The teeth are fitted in sockets which can be readily applied to either iron or wooden frames.

This invention has been patented by Messrs. P. C. and I. A. Carstensen, of Walnut, Iowa.

A CORRESPONDENT of the *Engineer*, London, commends the water-tight coal bunkers of the new United States steamship Chicago, and thinks that if the Austral had been so provided she would not have gone down so readily.

A New Aperiodic Galvanometer.

If we add a third magnetic needle to an astatic galvanometer, so that it is below the frame and parallel to the two others, and so that its poles may be opposite to those of the needle above it, we obtain a galvanometer the sensibility of which is nearly trebled, and which preserves a directive force. We may also reverse the arrangement, making the frame movable, into which the current arrives by the suspension wires, and leaving the needles fixed.

The above considerations have led the author to devise an *aperiodic* galvanometer, which has been exhibited at the Vienna Electrical Exhibition. A more perfect model has since been constructed by the firm of Breguet.

In this instrument the six poles are retained, but the poles are formed by three horse shoe magnets with legs very near together. These three fixed magnets are placed horizontally one below another, at a distance of 0·005 meter. The frame incloses the two poles of the middle magnet, with play sufficient to permit it to oscillate freely, and obtain a deviation of 20° on each side. The light wire of this small frame is perpendicular to the axis of the magnets, and the current arrives by means of the suspension wire, as in the siphon recorder of Sir W. Thomson and other analogous frames.

If we place this galvanometer in communication with the two ends of a telephone from which the vibrating plate has been removed, then, in order to make the frame deviate, it is sufficient to let fall upon the pole of the magnet of the telephone a small fragment of iron filing, weighing a few milligrammes. This example will show its sensitiveness.

It is completely aperiodic, *i. e.*, if the two extremities of the galvanometer are connected by a wire of little resistance, the frame, having deviated from its position, stops at zero without passing it.

If we examine the position of the lines of force with reference to the four sides of the frame, we see that electromagnetic induction is produced on the four sides of the frame, and in the same direction.—*M. G. Le Goarant de Tromelin, in Comptes Rendus.*

The Present Nail Product.

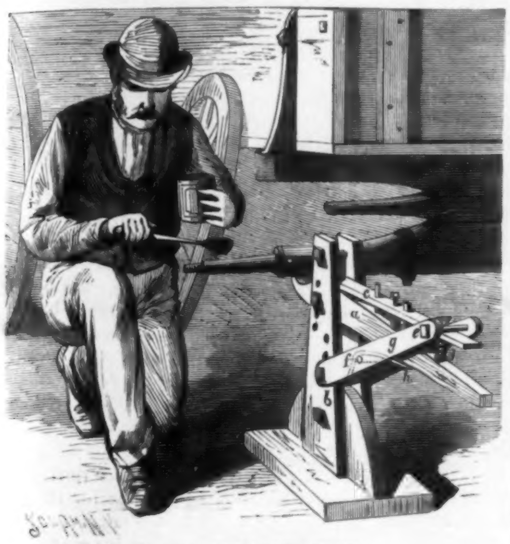
The *Bulletin* of the Iron and Steel Association prints a list of the nail works, and states that seventy-four now completed have 5,008 machines, and will add 391 more before the close of the year, while there are five new works being built which will have at least 200 more nail machines in operation by January 1. By that time there will be 6,599 nail machines ready to work, with a capacity of 12,376,000 kegs of cut nails and spikes yearly. The mills and machines now completed have a capacity of about 1,000,000 kegs less; about 3,264,000 in Pennsylvania, 2,200,000 in Ohio, 1,668,000 in West Virginia, 875,000 in Massachusetts, and 690,000 in New Jersey.

Apropos of the same subject, the Philadelphia *Press* remarks: "The building boom has been for at least nine months past the chief support of the iron market; but there are many minor signs that it is near its end. The pause in the rise of rents on Manhattan Island last May was the first indication that building in New York city was overdone, and it has been followed by others which point to a serious check in real estate values there in the next six months. Nails, which since their tremendous jump in 1879-80 have been in steady demand, now show overproduction. The capacity of the nail works in the country, finished or unfinished, is 12,376,000 kegs, or twice the output in 1882, and this increase is launched on a failing market. In addition, various forms of iron used in building show a decided decrease in demand. Unless there is a sudden increase in railroad building, the falling off in house building must have a serious effect on the labor market before spring."

T. G. MERRILL, a mining engineer, says that this year's product of the Montana gold mines will reach $15,000,000.

WAGON JACK.

The wagon jack herewith illustrated has been recently patented by Mr. Andrew J. Burke, of Elm Grove, Illinois. The lever, *a*, is pivoted to standards, secured to a base, and provided with apertures for the pintle to permit adjusting the lever higher or lower. That end of the lever which supports the axle is slightly hollowed out. A lever, *c*, is pivoted on the lever, *a*, at the end near the standards, and is pressed upward by a spiral spring, *d*, surrounding a pin projecting upward from the free end of the lever, *a*, and passing through a hole in the end of the lever, *c*, the head of the pin being above this lever. Guide pins on the lever, *a*, pass through holes in the other lever. Two levers, *g*, pivoted to the sides of the standards are united at the free ends by a cross pin, *e*, above the lever, *c*. The apertures in the standards permit pivoting the levers, *g*, at any desired height. A spring, *h*, has one end mounted on the pintle of the levers, *g*, as shown by the dotted lines, *f*; the other end



BURKE'S WAGON JACK.

bears against the bottom edge of the lever, *a*. Between its ends the spring passes over a bolt, *f*, uniting the levers, *g*. To use the jack the hollowed end of the lever, *a*, is placed under the axle and the other end pressed downward. After the cross pin, *e*, has passed the pin, *d*, the free end of the lever, *c*, is pressed toward the lever, *a*. The spring, *h*, presses the levers, *g*, downward. The lever, *c*, is pressed by its spring against the cross pin, *e*, and is held against the pin, *d*, the head of which prevents the lever, *c*, from pressing the cross pin above the upper end of the pin, *d*. The levers, *g*, thus hold one end of the lever, *a*, lowered, the other end and the axle on it being raised.

IMPROVED RUELLE FURNACE FOR REVIVIFYING BONE BLACK.

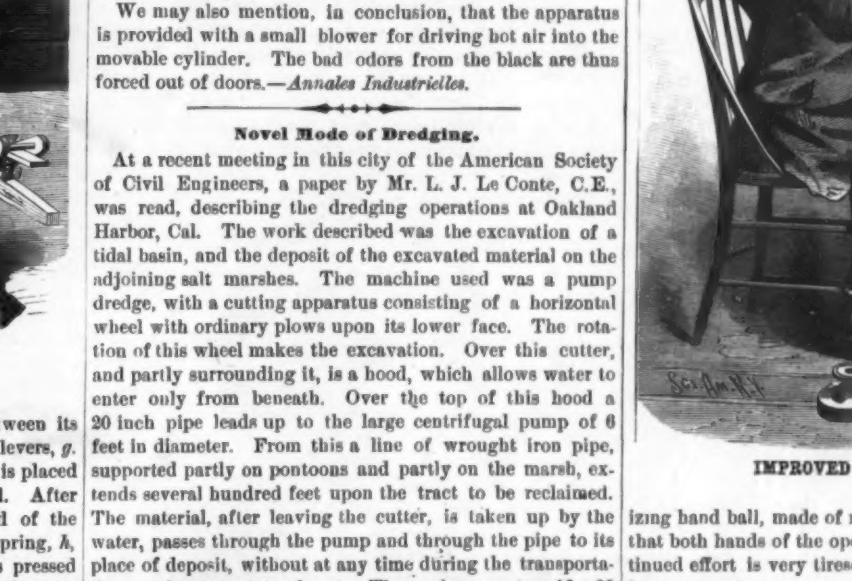
The revivification of bone black, after it has been used, is a very important operation in every sugar manufactory. Among the numerous systems of furnaces that have been proposed for performing it, very few have given the results that were expected of them. The Ruelle furnace, represented in the annexed cut, is not a novelty, and, if we now advert to this well known apparatus, it is because it has been the object of some relatively recent improvements, which it has seemed to us would be of interest to make known.

As well known, this furnace consists of a certain number of vertical retorts, designed for baking the black, and the upper extremity of which debouches into a hopper, into which the black to be revivified is thrown, while their lower extremity debouches into cooling tubes. The whole is inclosed within a cylindrical casing of fire bricks covered with plate iron. The first improvement added to the apparatus is the automatic method of emptying the tubes. With this object in view, the apparatus is so constructed that it may be revolved around a central axis by means of an endless screw and gear wheels. Each cooling tube is provided at its lower part with a distributing box of cast iron, and between this and the tube there is arranged a sheet iron valve, provided with a steel spring, which opens or shuts in passing into a bifurcation, and permits the black to enter the box. The distributing box is provided with a counterpoised door that is opened and closed by the same method as the valve just mentioned, so that on the second revolution of the furnace the black that is contained in the box falls over an inclined plane into a bag, or into a car.

Formerly the black to be revivified was, before being introduced into the retorts, dried upon a cast iron table, which was heated by waste heat from the fire-place. For the last year and a half this table has been replaced by a mechanical drier. This is the second improvement which we have to call attention to.

This drier consists of two concentric sheet iron cylinders, the external one of which is fixed, while the internal one is given a rotary motion through an endless screw and a helicoidal wheel. This latter cylinder is provided internally with four spiral paddles that each forms a quarter circumference on the length of the cylinder, so as to constantly stir up the black and cause it to move forward progressively toward the furnace hopper. A furnace designed to revivify from 100 to 110 hectoliters of black every twenty-four hours contains 54 retorts, and burns but 5 hectoliters of coal. With the system of emptying the tubes just described we are always sure of revivifying the same quantity of black—the latter remaining the same length of time in all the retorts. Moreover, as the latter receive the same degree of heat, we are certain that the black will always be baked uniformly. The mechanical drier is not only advantageous because it is heated by waste gases, but also because it prevents the black from being crushed or wasted. In this furnace the internal cylinder is 6 meters in length by 0·85 in diameter at the entrance and 1 at the outlet. The external one is only 6 meters in length, and its diameter but is 1·3 meters.

We may also mention, in conclusion, that the apparatus is provided with a small blower for driving hot air into the movable cylinder. The bad odors from the black are thus forced out of doors.—*Annales Industrielles.*



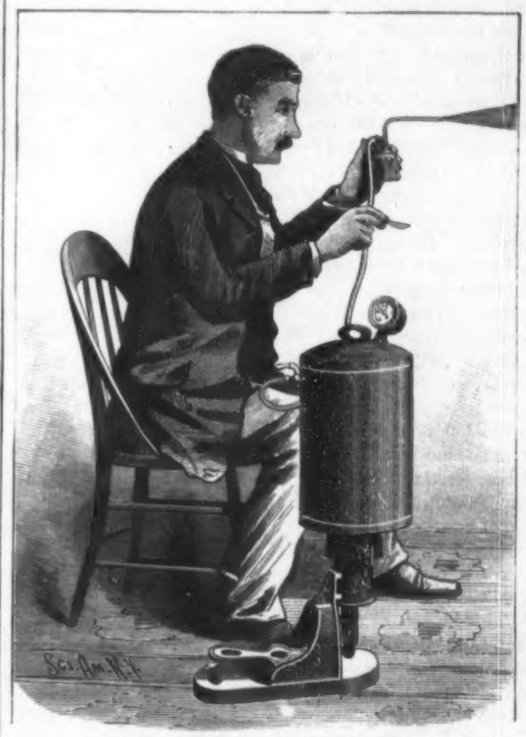
FURNACE FOR REVIVIFYING BONE BLACK.

Novel Mode of Dredging.

At a recent meeting in this city of the American Society of Civil Engineers, a paper by Mr. L. J. Le Conte, C.E., was read, describing the dredging operations at Oakland Harbor, Cal. The work described was the excavation of a tidal basin, and the deposit of the excavated material on the adjoining salt marshes. The machine used was a pump dredge, with a cutting apparatus consisting of a horizontal wheel with ordinary plows upon its lower face. The rotation of this wheel makes the excavation. Over this cutter, and partly surrounding it, is a hood, which allows water to enter only from beneath. Over the top of this hood a 20 inch pipe leads up to the large centrifugal pump of 6 feet in diameter. From this a line of wrought iron pipe, supported partly on pontoons and partly on the marsh, extends several hundred feet upon the tract to be reclaimed. The material, after leaving the cutter, is taken up by the water, passes through the pump and through the pipe to its place of deposit, without at any time during the transportation coming to a state of rest. The engines are two 16 x 20 inch engines, used exclusively for driving the centrifugal pump, and two 12 x 12 inch engines for driving the cutting apparatus, swinging the gear, etc. The steam is supplied by two 100 horse power boilers, generally carrying from 90 o 95 pounds of steam. The amount of material transported with the water runs at times as high as 40 per cent by volume; but experience has shown that in the material excavated at this point, which is a blue clay mud, it is not advisable to carry more than 15 per cent, particularly in order to secure a uniform distribution at the place of deposit. The total quantity moved by one dredge in eight months was 250,000 cubic yards. The best work in one month was somewhat over 60,000 cubic yards in 230 engine hours; the average distance of transportation being 1,100 feet. The greatest distance transported was during October, when 45,000 yards were deposited in 190 engine hours, through 1,600 to 2,000 feet of 20 inch pipe. The average daily expense account was stated as approximately $102.00, but this did not include the cost of the nine or ten men on shore, employed to secure a proper disposition of the material, particularly as the fill approaches completion. Nor did it include the cost of retaining embankments where required. The result of the work was stated to be, with this one pump dredge, an average of 30,000 cubic yards, measured in the cut at a maximum cost of 10 cents per cubic yard; and in one particular month of 23 days' work, 60,000 cubic yards were deposited on shore at a distance of 1,600 to 2,000 feet from the dredge, at a cost of 5 cents per cubic yard. The complete distribution of the material at the place of deposit has been very satisfactory, the result being a cluster of cones whose slopes are very flat; not more than 1½ per cent, and frequently so slight as to appear almost level.

IMPROVED AIR COMPRESSOR.

To successfully use atomized liquids in the treatment of diseases of the upper air passages, it is necessary that the current be continuous. The well known double bulb atomizing hand ball, made of rubber, has the great disadvantage that both hands of the operator are employed, and the continued effort is very tiresome. The accompanying engraving represents an apparatus which is easily worked, compact in form, and light in weight. The pump cylinder is 2½ inches in diameter by 3 inches stroke, is mounted on an arched stand, and contains a piston furnished with a valve opening upward. The piston is connected to the foot pedal by a forked connecting rod, and is moved by a slight and easy motion of the foot. The upper end of the pump cylinder is closed, with the exception of an aperture, which is covered by a valve opening upward into a cylindrical air reservoir secured to the upper end of the pump. A flexible rubber hose is attached to a stop cock near the top of the reservoir. Immediately on top is a spring gauge indicating the air pressure from one to twenty pounds. By a little exertion on the part of the operator, the pressure can be kept at any point, and, when filled to ten or twelve pounds, there is air enough to give a spray, with a good atomizer, for ten minutes, or long enough to make application to three or four patients in succession without pumping.



IMPROVED AIR COMPRESSOR.

The same plan furnishes a simple and efficient device for maintaining a continuous supply of air for blow pipe use. As much of the oxygen of the air is taken up by the lungs, exhaled air is deficient in heating qualities. This defect is overcome by the use of the compressor, which not only saves a great amount of hard work, but delivers a stronger and steadier blast than is possible to maintain with the mouth. With ordinary care it will last for years, the only attention required being a drop of oil occasionally on the leather packing ring.

The apparatus is manufactured by Mr. J. Elliott Shaw, 154 South Fourth Street, Philadelphia, Pa.

A Liniment for Rheumatism.

The *Therapeutic Review* says: Methyl salicylate (oil of wintergreen) mixed with an equal quantity of olive oil or linimentum saponis, applied externally to inflamed joints affected by acute rheumatism, affords instant relief, and, having a pleasant odor, its use is very agreeable."

Sir William Siemens.

We much regret to have to announce the sudden death of Sir William Siemens, which occurred on the evening of Monday, the 19th of November, in consequence of an injury to the heart, brought about by a fall a fortnight previously. Walking home from a scientific meeting on the afternoon of Monday, the 5th, he tripped and fell while crossing Hamilton Place. Though for a day or two no apparent harm resulted, it was soon found that the heart had been—it was hoped slightly—injured, or, at all events, that the shock, acting on a previously existing morbid condition, had had injurious effects. Still there seemed no reason to fear that rest would not repair the mischief, till on Monday, quite suddenly, the end came.

By his death English science has suffered a severe loss, and a loss which will not readily be made good. At a time when the tendency of science is more and more to specialize itself, and scientific men are often compelled to study one particular branch of a subject alone, it is very rare to find a mind like that of Sir William Siemens, who devoted himself to many distinct branches of science, and yet excelled in them all. Not only has he done much for the advancement of pure science, but it may be said without contradiction that he has, beyond all his contemporaries, promoted the practical application of scientific discoveries to industrial purposes. He was an ardent scientific discoverer, a large and successful manufacturer in at least two distinct branches of industry, an engineer of high rank in the profession, and besides this he was a shrewd and clear-headed man of business.

Charles William Siemens was born at Leuthe, in Hanover, on the 4th of April, 1823. He was educated at the Gymnasium at Lübeck, afterward at the Polytechnic School at Magdeburg, and finally at the University of Göttingen. Here he studied under Wohler and Himly. In 1842 he became a pupil in the engine works of Count Stolberg, and here he laid the foundation of his engineering knowledge—knowledge he afterwards turned to such good practical account. The fact that he was one of a family of inventors makes it rather difficult to say what was the precise personal share he had in the many inventions for which the world is indebted to the four gifted brothers—Werner, William, Carl, and Frederick. They all worked so harmoniously together—the idea suggested by one being taken up and elaborated by another—that it is hardly possible to attribute to each his own proper credit for their joint labor. The task, too, is rendered all the harder by the fact that each brother was always ready to attribute a successful invention to any of the family rather than to himself. It may, however, be said that in electrical discovery the two brothers William and Werner were principally associated, while the regenerative furnace is due not only to William, but also to Frederick. It was to introduce to the English public a joint invention of his own and his brother Werner in electrogilding that William Siemens first came to England. This was in 1843. Speaking two years ago to the Birmingham and Midland Institute, Dr. Siemens, as he was then, gave an interesting and somewhat touching account of the difficulties which not unnaturally beset the young foreign inventor, so ignorant of the language of the country that his first visit was to an "undertaker," under the impression that he was a suitable person to take up and bring out his invention. Thanks to the kindly discrimination of Mr. Elkington, who was able to perceive that certain processes described in some of his own patents could only be carried into effect by the improvements of the Siemenses, he was able to dispose of his invention so far successfully that he was induced in the following year to come back again on a similar errand. This time it was his "chronometric governor," an apparatus which, though not very successful commercially, introduced him into the engineering world, and was really the cause of his settling in this country. The chief use of this apparatus, intended originally for steam engines, has been found in its application to regulate the movement of the great transit instrument at Greenwich.

His studies in the dynamical theory of heat led him to pay special attention to methods of recovering the heat generally allowed to run to waste in various engineering and manufacturing processes. The first application of these researches was in the regenerative steam engine which he set up in 1847 in the factory of Mr. Hicks, at Bolton. In this superheated steam was employed, but its use was attended with certain difficulties which have prevented the commercial introduction of the invention. The Society of Arts may have the credit of being the first public body in England which recognized the value of the principle by awarding Mr. Siemens a gold medal in the year 1850 for his regenerative condenser. The direction in which he was then working was stated in a paper he read before the Institution of Civil Engineers in 1853 on the conversion of heat into mechanical effect. This paper gained him the Telford Premium and medal of the Institution. In 1857 Siemens, in connection with his younger brother and then pupil, Frederick, turned his attention to regenerative furnaces for metallurgical purposes. The regenerative gas furnace, as it is certainly the greatest invention due to the Siemenses, so is the one in which William Siemens is believed to have had the largest share. The first successful application of these furnaces was in 1861. The principle of the regenerative furnace is tolerably well known; it may suffice to say here that its main feature consists in an arrangement by which the waste heat of the products of combustion is utilized by being imparted to the air and to the gaseous fuel by which combustion is supported. This is effected by causing the products to pass through chambers in which the heat is taken up by masses of brickwork, and afterward passing the incoming currents of air and gas among the heated brickwork. The earlier applications of this principle to steel and glass making have been followed by its extension to many other industrial purposes in which great heat is required, the powers of the furnace being only limited in practice by the nature of the materials of which it can be constructed.

The application of the furnace to the making of iron and steel naturally led the attention of its inventor to other improvements in the same manufacture. In 1862 he endeavored to reduce to practice the result of Reaumur's experiments in making steel by fusing malleable iron with cast steel. After some years' experimenting the Siemens process of steel making was perfected, and a little later still the Siemens-Martin process. In the latter, scrap iron is melted in a bath of pig iron on the hearth of the furnace; in the former, ore is reduced. The production of steel in this country under Sir William Siemens' processes was over 340,000 tons in 1881.

But if the inventions of this regenerative furnace and of improved processes for steel making are those which are most likely to keep alive in future years the memory of their inventor, it is just now with the electric light that the name of Siemens is most closely associated in the popular mind. The precise date at which he may be said to have commenced his work in this direction can hardly be given. It was in 1867 that his classical paper on the conversion of dynamical into electrical force without the aid of permanent magnetism was read before the Royal Society. Strangely enough, the discovery of the same principle was enunciated at the same meeting of the Society by Sir Charles Wheatstone, while there is yet a third claimant in the person of Mr. Cromwell Varley, who had previously applied for a patent in which the idea was embodied. It, therefore, can never be quite certain who was the first discoverer of the principle on which modern dynamo machines are constructed. As regards the Siemens discovery, the originator of the idea was Dr. Werner Siemens, who, on being shown an electrical motor constructed without permanent magnets, immediately saw that a generator without permanent magnets was equally possible. The details, however, of the construction of the Siemens machine, and the various improvements by which it has been brought to its present form or rather forms (for there are, of course, several varieties) are due alike to the younger and the elder brother. And the same may be said of the various inventions connected with telegraphy and the electric light which emanated from the great firm of Siemens Brothers. Some of these were entirely worked out by one, some by the other brother, more were the joint production of both, but no attempt was made to separate them or to discriminate. How great were the inventive resources of Sir William is well shown by the saying common in his workshops, that as soon as any particular problem had been given up by everybody as a bad job, it had only to be taken to Dr. Siemens for him to suggest half a dozen ways of solving it, two of which would be complicated and impracticable, two difficult, and two perfectly satisfactory.

DR. C. W. SIEMENS, F.R.S.

As regards telegraphy, the most important work executed by the firm was the laying of the Direct United States Cable in 1874, for which work that remarkable vessel the Faraday was built after the designs of Sir William Siemens. A good instance at once of the versatility of Sir William's talents and of his engineering skill is given by the arrangement of the screw propellers in this ship. Their shafts (the Faraday is a twin screw) are set at a slight angle, diverging outward, as has often been proposed, but inward, toward each other. The effect of this is that the thrust of each propeller, when used singly for steering purposes, acts at a much more effective angle, and the result is that the vessel can turn in her own length, when the engines are worked in opposite directions. The Faraday is most completely fitted up with every possible appliance for cable laying, grappling, and recovering lost cables, but the above small detail is only referred to here as illustrating the way in which Sir W. Siemens dealt with a purely engineering question, which might have been considered quite beside the ordinary direction of his work. To record fitly what he and his firm have done for the advancement, not only of electric lighting, but of the various practical uses of electricity, would involve the enumeration of an infinity of technical details, each comparatively unimportant, but each fitting into its own place and serving to produce a complete whole. To enter fully into the amount of electric lighting work effected by them would invite comparisons which at the present moment are above all things to be avoided. It may, however, be said that if a careful examination were made of the working installations of the electric light, it would be found that a very considerable portion of the real work done had been done by the firm of Siemens Brothers. At the Paris Exhibition they were *facile principes;* at Munich, at Vienna, at the Crystal Palace, they were alike conspicuous.

The process of "anastatic printing," a process only superseded by recent advances in photographic processes, was due to William and Werner Siemens. It was described by Faraday in 1845. Faraday, too, it may be noted, had for the subject of his last lecture at the Royal Institution the advantages of the Siemens furnace. Improvements in calico printing, the invention of a double cylinder air pump and of a water meter, are also among the earlier work of William Siemens. Among more recent inventions may be noted his bathometer, for measuring the depth of the sea without a sounding line, his electrical furnace, his electrical thermometer and pyrometer, his rotatory furnace for the production of iron and steel by the direct process, his deep sea electrical thermometer, and his regenerative gas burner.

Sir William Siemens was elected a Fellow of the Royal Society in 1862, and in 1869–70 he served as one of the Council. He became a member of the Institution of Civil Engineers in 1854, and has been on its Council for some years. He was the first president of the Society of Telegraph Engineers, and served a second time in that capacity. He has been President of the Institution of Mechanical Engineers, of the Iron and Steel Institute, and of the British Association. He was Chairman of Council of the Society of Arts.

The honors he has received for his inventions and discoveries are very numerous. This brief record may serve to show how valuable was the life that has just passed away, how great the loss of what a few more years of strenuous work might have yielded. Those who knew him may mourn the kindly heart, the generous, noble nature, so tolerant of imperfect knowledge, so impatient only at charlatanism and dishonesty; the nation at large has lost a faithful servant, chief among those who live only to better the life of their fellow men by subduing the forces of nature to their use. Looking back along the line of England's scientific worthies, there are few who have served the people better than this, her adopted son, few, if any, whose life's record will show so long a list of useful labors.—*London Times.*

Dr. John L. Le Conte.

The death of Dr. John L. LeConte at his home in Philadelphia on Thursday, November 22, at the age of fifty-eight, removes one who has long been the leader, *facile princeps*, of American entomologists. With his death the younger men are completely separated from the former generation of workers in this field, and they will lose a friend and teacher to whom they constantly looked. Dr. Le Conte was as highly honored abroad as at home, and has been an active investigator for nearly forty years. His death occurred during the session of the National Academy, of which he was a member, but was not known in New Haven until its close.

One More Number.

The next issue will close another volume of this paper, and with it several thousand subscriptions will expire.

It being an inflexible rule of the publishers to stop sending their publications when the time is up for which subscriptions are prepaid, present subscribers to the SCIENTIFIC AMERICAN or SCIENTIFIC AMERICAN SUPPLEMENT will oblige us by remitting for a renewal without delay.

By heeding this request to renew immediately, it will save the removal of several thousands of names from our subscription books, and insure a continuance of the papers without interruption.

And we would suggest to employers if it would not be to their advantage to present to their superintendent or other employe one year's subscription to the SCIENTIFIC AMERICAN or SCIENTIFIC AMERICAN SUPPLEMENT, or both papers, as a recognition for meritorious services.

It seems to us that a small investment thus made would be likely to be a good one, for both the donor and recipient.

Correspondence.

"What is the Natural Age of a Cat?"

To the Editor of the Scientific American:

I had a cat that died last June whose age was a month or more over twenty-five years. This is the same cat that was mentioned in a great many papers last winter, and was called twenty-three years old, whereas, according to correct reckoning, she was twenty-five years, instead. She had one kitten two years old at the time of her death. About the time she had the last kitten she renewed her teeth. She never shed her hair for the last two or three years, which became very coarse and stiff. She died with lung disease. She always lived at the barn and outdoors.

C. V. SWARTWOUT.

St. Lawrence, N. Y., November 5, 1883.

The Brandy Bread Co.

To the Editor of the Scientific American:

In your paper of Sept. 1, 1883, in the article upon "Fermentation in Bread," you finish by asking, "Will not some American repeat this experiment?" that is, make alcohol from the fumes from oven while baking bread.

About 1836 the writer saw a very large bakehouse erected somewhere in Tipton, Staffordshire, called the Brandy Bread Company. I can just recollect that the doors were made steam tight, and that the bread was insipid, or tasteless, and that some thousands of pounds sterling were lost, and the company went bankrupt.

I should be sorry if this account should prevent the trial you suggest, for in forty-three years immense strides have been made in chemistry.

THO. BOOTH.

Gayam Sugar Mill, Pasvervewan, Java, Oct. 20, 1883.

The Sunset Colors.

To the Editor of the Scientific American:

I see in your paper of the 8th inst. you seem to attribute our recent fiery sunsets to the supposed presence of a stratum of meteoric dust. Would it not be more reasonable to consider it volcanic dust thrown up by the late terrific outburst in Java?

The forces there in operation—unparalleled I believe in all human history—were evidently adequate to such an effect, and the fact that immense quantities of something were thrown into the air is attested by the greenness of the sun as seen in India. Besides, the time since the Java earthquake has been just about what we might suppose sufficient for the dust to diffuse itself to this distance.

Sixty-one tons of impalpable dust thrown into the air would allow about one ounce to each tract of ten miles square over all the earth's surface. This, I think, would be quite sufficient, when viewed at an oblique angle with the stratum containing it, and nearly in the direction of the sun, to be plainly visible. Having thus an adequate and probable cause, there seems to be no need of ascribing the phenomenon to any mysterious extramundane cause, of which we can know comparatively nothing, but of which we may imagine everything.

S. S.

December 10.

Storing Wind Power for Small Motors.

To the Editor of the Scientific American:

Your correspondent A, on page 353, proposes to drive a boat 14 feet long for 5 consecutive hours with air compressed to 200 atmospheres, in a 2 inch pipe placed along the gunwale of the boat, the owner, at his choice, using a screw or paddles to drive the boat.

I have a very light boat built of ⅜ inch pine, somewhat longer than A's theoretical one, but I fancy just as easily propelled, driven by a 3 x 3 inch cylinder, screw 18 inches in diameter. The time occupied in driving this boat two miles averages 18 minutes, carrying 100 pounds to the square inch on the boiler, the wheel turning an average of 400 revolutions per minute, making in all 7,200 revolutions to complete the two miles. Comparing A's air engine with mine, I think his theory will not be borne out in practice. I suppose his theoretical pipe or receiver runs under both gunwales. This would make it 28 feet. My steam engine may not be as economical in its consumption of steam as it might be, as it cuts off only at ¾ stroke. A's air engine will doubtless be arranged to work more expansively, say his cylinder is to be 2 inches in diameter, 3 inches stroke, cutting off at ⅝, then expanding into another cylinder 4 inches in diameter, same stroke. Throttle down his air supply until it passes into the first cylinder at 100 pounds, and probably, if his engine is well made, he may obtain as good results as I do with my 3 x 3 cutting off at ¾. If he used the same wheel that I do (my foundrymen tell me it is the best obtainable, his engine must necessarily make the same number of revolutions to run the same distance. Four inches, therefore, of the supply in his air pipe would be exhausted at every revolution of the engine if the pipe were charged at 100 pounds; but as it is supposed to contain 3,000 pounds, the 4 inches, if the pressure were constant, would accomplish 30 revolutions. The receiver being 28 feet long the sum would stand thus: $\frac{336}{4} \times 30 = 2{,}520$ revolutions his wheel would make on his receiver's becoming exhausted, if, as before said, the pressure was constant, which unfortunately it is not.

In my opinion, therefore, his theoretical little boat would prove a failure. It would only run for a few minutes, and would need a second "placing to the windmill" before she ran a mile.

ALIA TENTANDA VIA EST.

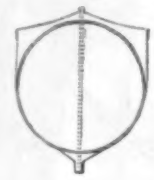
Plan of Fast Steamers.

To the Editor of the Scientific American:

The official assertion of Mr. Fawcett, Postmaster General of England, "that after the expiration of the present contract for carrying the mail across the Atlantic to the United States shall have expired, he shall cause to be paid to the fastest mail steamer for carrying the letters three shillings per pound, and for the newspapers only three pence per pound." Now, as the fastest steamers only shall have the contract, the question arises, Who will own the fastest steamers—the English or the Americans? And who will adopt on scientific principles the plan of building the fastest boats?

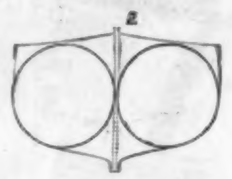
The present transatlantic steamers can with propriety be called floating palaces, but they are all built on "the one log section," they are as deep as they are wide, and built without any regard to the metacenter of a floating body.

1



(Fig. 1.) In floating bodies the stability depends on the form of that body, and this form is the most improper or the most unstable, as it would require but a little force to set it rotating, unless ballast as a principle were applied to obviate this rotating tendency in this "one log form;" and the more ballast to carry out the principle of stability the deeper the boat sinks into the water, hence greater the resistance the boat has to overcome. These boats are all built with a "nice, clean run" fore and aft; this too is detrimental to their forward motion in a heavy sea, as far as their "forerun" is concerned. The bow of a boat should be wedge-shaped, and the knuckle on a line from the "fore foot" to as far back on the plank shears as the length of the wedge-shaped bows extends back, with a long "run" aft, so that when the boat sets on a sea it will have a tendency to slide forward at each such downward motion. You may imagine a slate sinking in water to illustrate this principle. And in place of the "one log section" we would adopt the "two log plan," as illustrated in Fig. 2. This obviously is a stable floating body, and to enhance its stability we would suggest that the keel be a boiler iron tube filled with molten metal, care to be taken that the keel tube is not too large, and the long "clean run aft" to be furnished with a "screw" in place of the "fan" in use; and the single surface measurement to be fully equal to the resistance offered by the water at the bows of the boat, so that a screw ten feet long (say) having the required surface would move the boat (say, all things considered) nine feet at each revolution with a motive power to drive the screw three hundred revolutions a minute, which would move the boat seven hundred and twenty-five miles in twenty-four hours.

2



Now as to the construction of the screw, which should be made of four separate flanges, each flange to pass once around the screw shaft in its length of ten feet, and of such diameter as to measure on their single surface the same as the resistance offered to the bow of the boat, or the screw may have more hold of the water than the resistance offered by the water at the bow of the boat; the more the difference the greater the speed. One flange to pass around the screw shaft several times to have the required measurement would be a violation of the principle. Since the Daphne disaster the Clyde ship builders have turned their attention to the subject of stability tests in the Clyde shipyards. The Glasgow and Londonderry Steamboat Co., who are owners of the Daphne, have ordered a steamer to replace the Iris, that has been recently lost on the Irish coast. They stipulate that the stability in every respect should be perfect, and the builder must satisfy himself with designs to attain that end.

Being myself an American by adoption, I would prefer that the fastest boat in the world should sail from New York or some other American port for this coast. Tube compartments would be the safest in transatlantic steamers, and the machinery could be tube inclosed.

Should these suggestions be of any value, be pleased to use them to the best possible advantage.

Yours respectfully,

WILLIAM GRIFFITHS.

Ala Nursery, Pjollheli, North Wales,
Great Britain, Oct. 30, 1883.

Enterprise in Dakota.

To the Editor of the Scientific American:

My attention was attracted by a short article in your issue of December 1, describing the rapid growth of the town of Woonsocket, Dakota.

It so happened that I was at the aforesaid town twice a few weeks since, and can vouch for the truth of the story of its wonderful growth. The first time I passed through, the place was just ten days' old, and contained sixty-five buildings in process of erection, only two of which had progressed far enough to be painted. Five days later I was there again; there were then a number of other buildings under way (the exact number I do not know), and about a dozen or fifteen of the older ones were not only painted, but occupied. The depot was finished and in use, and the town contained the usual number of saloons, eight or ten stores, one or two law offices, several of the inevitable "land and loan" offices, two hotels (unfinished), and, if I mistake not, a newspaper. Nearly every one of the buildings mentioned above was a *bona fide* store or dwelling; for in the "booming" places the out-buildings are left until the last thing.

At the time referred to Woonsocket was, and presumably is now, an ideal "booming town." Mechanics were getting fabulous prices and were in great demand. Whole trains of freight cars, loaded with building material, stood upon the tracks, waiting to be used. Building lots which sold originally for one hundred dollars had brought three hundred a little later on, and were now selling for six hundred. Large numbers of lithographic "plats" of the town had been struck off, and were being forced upon every stranger who happened to set foot in the place. The envious inhabitants of the neighboring towns have changed the name Woonsocket into "Boom-struck-it," which certainly correctly expresses the state of affairs.

CHARLES T. BEARDSLEY, JR.

Birmingham, Conn., December 4.

J. A. asks (1) how "opodeldoc" is made. A. Take of shavings of Castile soap 4 ounces, of gum camphor 2 ounces, of oil of rosemary ½ fluid ounce, of water 6 fluid ounces, and of alcohol 1 quart. Digest the soap in the water until it is dissolved; dissolve the camphor and oil in the alcohol; then mix the two solutions, and filter. (2) What is a good recipe for rheumatism? A. The following has been highly recommended: Take of gum guaiac 2 ounces, of nitrate of potassa 1 ounce, of sulphuret of antimony 2 drachms, of gum camphor 2 drachms, of gum opium 1 drachm, of saffron 20 grains, and of gin 1 pint. Mix. Dose, one teaspoonful three times a day in a little sweetened water. In a complaint like rheumatism it is better to consult a good physician than to rely upon published recipes, which, although they may have proved efficacious with some persons, may not be adapted to the cases of others.

Wire Fences in Georgia.

A lawful wire fence in Georgia is described by legislative enactment as composed of not less than six horizontal strands of barbed wire tightly stretched from post to post. The first wire no more than four and a half nor less than three and a half inches from the ground; the second wire not more than nine and a half nor less than eight and a half inches from the ground; the third wire not more than fifteen and a half nor less than fourteen and a half inches from the ground; the fourth wire not more than twenty-two and a half nor less than twenty-one and a half inches from the ground; the fifth wire not more than thirty-two nor less than thirty-one inches from the ground; the sixth wire not over fifty-five nor less than fifty-three inches from the ground. Posts to be not over ten feet apart, and every alternate post to be securely set in the ground. *Provided*, a plank not less than ten inches wide shall be used instead of two strands of wire at bottom of fence. It is also required that a railing shall be placed equal distance between the two top wires, which shall answer the same purpose as a wire, and to extend from post to post in like manner.

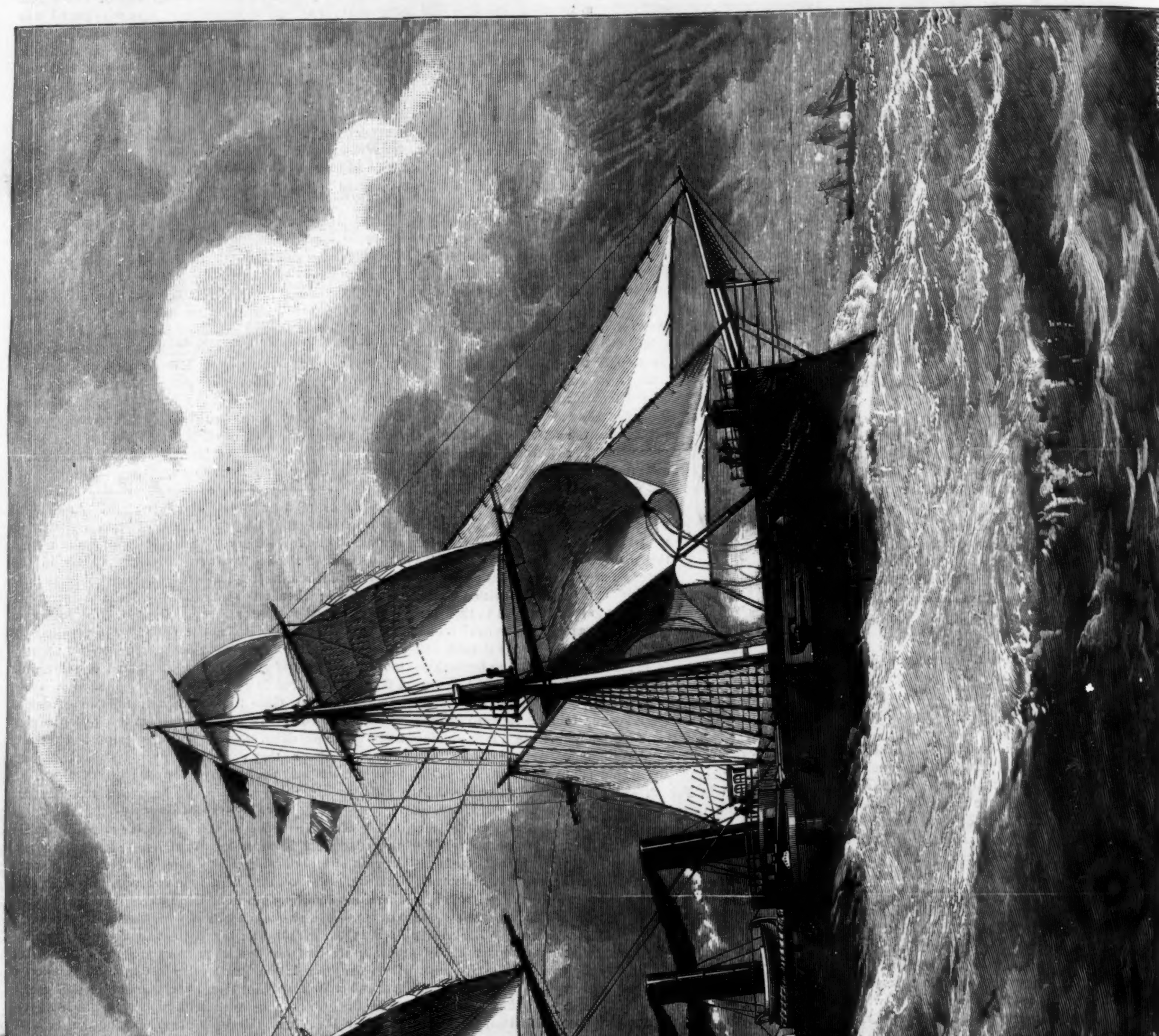
Am I a Scot, or am I Not?

If I should bring a wagon o'er
From Scotland to Columbia's shore,
And by successive wear and tear
The wagon soon should need repair:
Thus, when the tires are worn through,
Columbia's iron doth renew;
Likewise the fellies, hubs, and spokes
Should be replaced by Western oaks;
In course of time down goes the bed,
But here's one like *it* in its stead.
So bit by bit, in seven years,
All things are changed in bed and gears,
And still it seems as though it ought
To be the one from Scotland brought;
But when I think the matter o'er,
It ne'er was on a foreign shore,
And all that came across the sea
Is only its identity.

I came, a Scotchman, understand,
By choice, to live in this free land,
Wherein I've dwelt, from day to day,
'Till sixteen years have passed away.
If physiology be true,
My body has been changing too;
And though at first it did seem strange,
Yet Science doth confirm the change;
And since I have the truth been taught,
I wonder if I'm now a Scot?
Since all that came across the sea
Is only my identity.

WILLIAM TAYLOR.

Aurora, Ind.



THE NEW UNITED STATES WAR STEAMER CHICAGO

THE NEW UNITED STATES CRUISERS.

(*Continued from first page.*)

partments having a length of 136 feet. This space will have a double bottom 3½ feet deep, divided into fourteen water-tight cells. A steel deck 1½ inches thick will cover the machinery.

These compartments will be divided on each side by vertical longitudinal bulkheads, and the space between them and the sides of the boat will be filled with coal. From the water line to 8 feet above it this coal armor will be 9 feet thick, and aft will have a thickness of 5 feet from the water line to 14 feet below it. When the doors are shut, the coal bunkers and the pockets in the boiler rooms form thirty-four water-tight compartments. The deck covering the machinery compartments will afford protection by preventing the access of shot and water to the main compartments, but it is not expected to resist a 6-inch shot even at inclinations of from six to eight degrees; entering shot would in all likelihood explode in the coal without doing injury to the machinery.

The magazine rooms will be in the hold amidships, before and abaft the machinery space. The deck above them will be covered by a protecting plating three-quarters of an inch thick. All hatches through it are to have water-tight covers, and coffer dams reaching to the berth deck will surround the magazine hatches. Other divisions in the hold by bulkheads of steel and the shaft alley bulkheads, together with those already noted, divide the vessel into eighty-five water-tight compartments.

A system of drainage has been adopted by which the combined power of the steam and circulating pumps, having a capacity of 2,500 tons per hour, can be concentrated on any main compartment. In addition to this there will be six continuous acting hand pumps on the berth deck, having independent suctions to each main compartment, and each compartment of the double bottom; they deliver either directly overboard or into the fire main, which will extend about three-fourths of the length of the vessel amidships on the berth deck, with stand pipes to gun and spar decks.

The outside plating of the vessel will be nine-sixteenths of an inch thick, will weigh twenty-three pounds per square foot, and there will be a double plate at the water line from the stem to within 70 feet of the stern. The stem and stern posts are to be of hammered steel. The water-tight inner bottom will be plating 10 and 12½ pounds per foot. The berth deck will have a protective plating over the engine and boilers for 136 feet. The bow of the vessel will be strengthened for ramming.

The rudder and steering gear will be below water line. A fighting hand wheel and steam steering engine will be placed on the water-tight flat, to which communication can be had by telegraph from the bridges. In addition there will be a hand steering wheel on the spar deck and a steam steering wheel in the pilot house.

The vessel will be bark rigged, with an area of plain sail of 14,880 square feet. The coal bunker capacity will be 940 tons, while 300 tons additional can be stored away on the berth deck. This will enable the Chicago to steam 3,000 miles at 15 knots, or 6,000 miles at 10 or 11 knots per hour. The vessel will be ventilated by an exhaust system.

There will be twin screws operated by two pairs of two cylinder compound overhead beam engines, each of which will be placed in a separate water-tight compartment 22 feet long, and inclosed by a deck for protection. The high and low pressure cylinders will be situated side by side, are vertical, 8 feet apart, and 2 feet 1 inch and 3 feet 5 inches respectively from the midship line. The diameters of the cylinders will be 45 and 78 inches, and the stroke 52 inches. Each cylinder will be steam jacketed, and fitted with two double ported main slide valves, actuated by eccentrics through arms and rock shafts, each furnished with a steam cylinder and piston to balance the weight of the valves. The cut-off valves will be adjustable between the limits of one-eighth and five-eighths of the stroke. The exhaust steam from the high pressure cylinder will pass directly to the low pressure steam chests; suitable pipes will exhaust the steam into the condenser and atmosphere. The condensers will be furnished with tinned brass tubes having a cooling surface of 5,000 square feet each. Beside each condenser will be placed an independent, double-acting, combined air and circulating pump. Worked from the crosshead of each pump piston will be two double-acting feed pumps 5 inches in diameter.

There will be fourteen horizontal return tubular boilers, constructed of steel, and capable of carrying a pressure of 100 pounds. They will be placed in two separate water-tight compartments. The fire rooms will run fore and aft, and will be 10 feet wide. Each boiler will be 9 feet in external diameter and 9 feet 10 inches in length on the bottom, and will be set inclining from front to back, over a single furnace. Each furnace will have about 57½ square feet of grate surface, or an aggregate of 802 square feet in all the boilers. The shells will be five-eighths of an inch thick, and the heads three-quarters and five-eighths. The tubes will be lap-welded iron. In each smoke pipe, concentric with it, there will be a steam drum 9 feet in diameter and 9 feet long, with a shell seven-eighths of an inch thick; this will have eight 18-inch and four 15-inch lap-welded flues passing through it. The fire rooms will be air-tight, and each will be provided with two large blowers.

The battery of the Chicago will consist of four 8-inch high powered breech loaders, weighing 12 tons each, mounted on the flush spar deck in projecting half turrets, the center of the trunnions being 20½ feet above water. The turrets will be unarmored and the men will be protected only by shields on the guns. Six 6-inch B. L. R., weighing 4 tons each, will be mounted broadside on the gun deck, which will also be arranged for two additional 6-inch guns if found desirable. One 6-inch will be mounted in a recessed gun deck port on each bow. Two 5-inch guns will be placed in recessed ports abaft the captain's cabin. The 8-inch projectile weighs 250 pounds; the 6-inch 100 pounds, and the 5-inch 60 pounds. In addition there will be four 47 mm. and two 37 mm. Hotchkiss revolving cannons, mounted in fixed bullet proof towers.

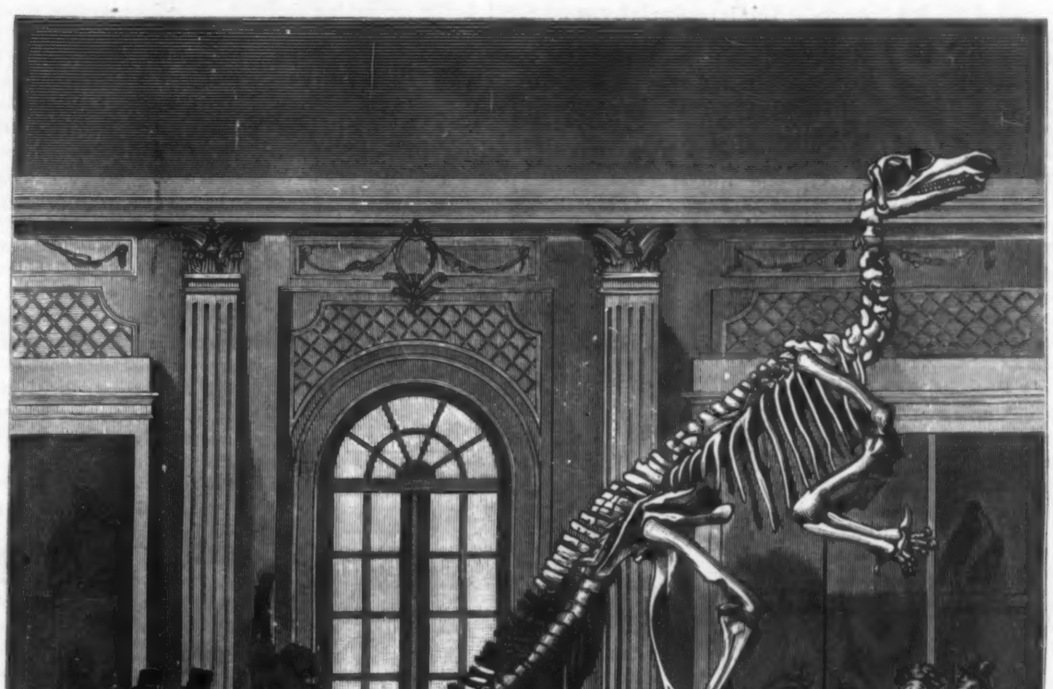
The contract price for the hull and fittings of the Chicago, exclusive of the masts, spars, rigging, sails, etc., is $889,000.

EXPERTS in chemistry have estimated that the cost of London's winter smoke and fog is $25,000,000 annually; that is to say, constituents of coal to this value escape unconsumed, and assist in forming the sooty vapor.

THE BERNISSART IGUANODONS.

The animal whose skeleton is represented in our engraving is, at a first glance, surprising by reason of its colossal size and its resemblance to the giant kangaroo. Like the latter, it has an enormous tail, very long hind legs, and very short fore ones. It seems as if it ought to be placed near that marsupial; but paleontologists, rightly setting aside all vulgar ideas, make it out a reptile. A reptile! A biped like man and like birds, capable of seizing his aggressor between his arms! It must be avowed that reptiles have changed much during the long route that they have traversed since geological times up to our own.

Surely, had any one in former times had any idea in regard to paleontology, and had any one suspected the existence of these forms so carefully preserved in the terrestrial crust, and so different from those of to-day, naturalists would have perhaps been embarrassed, but they most certainly would not have given the name of crawling animals to the interesting class in which are arranged, among others, the *Iguanodon*, a walking animal, the *Pterodactyl*, provided with wings, and the *Ichthyosaurus*, a swimmer which could only live in the bosom of the sea. And, what is worthy of remark, in secondary times, when these surprising beings were in their glory, reptiles seemed to outline, in a vague and colossal way, the principal types of those vertebrates which were destined to reign over the world, each in his time—the fish, the bird, and the mammal.



THE GREAT IGUANODON AT THE BRUSSELS MUSEUM.

Two years ago, I myself saw iguanodons in the course of preparation at the Brussels Museum. The bones of two individuals of these sufficed to fill a very large hall. One of them measured 10 meters in length, and the other 14. They had been found in 1878 at Bernissart, a locality situated between Mons and Tournai, very famous for its coal mines. It must not be thought, however, that these reptiles belonged to the coal epoch, for their remains lie buried in the lower Cretaceous strata (Wealden), known by miners as "dead lands," and which must be traversed to a depth of 300 to 400 meters before coal is reached.

Mr. Fages saw the first bones, Mr. Van Beneden determined the species, and Mr. Depauw, superintendent of the museum workshops, took upon himself the difficult task of working this rich vein of fossils. For this purpose he adopted the life of a miner and pursued his labors for three years at a depth varying from 322 to 356 meters. He was fortunate enough to exhume twenty-two iguanodons, fifteen of which are now mounted. He attained this result by inventing ingenious processes of solidifying the bones, which, being impregnated with pyrites, would otherwise have crumbled away upon contact with the air.

The following are, according to Mr. Dollo, who has made a very profound study of the *Iguanodon Bernissartensis*, a few details in regard to the structure of the gigantic reptile. It belongs to the sub-class of Dinosaurians and to the order Ornithopeda. The individual described by the learned Belgian is 9·5 m. from the end of the nose to the extremity of the tail, and, when standing upright upon its hind legs, rises 4·36 m. above the level of the earth. Its head is relatively small, and much compressed in the direction of the bilateral diameter. The nostrils are spacious, and apparently partitioned in their anterior region. The orbits are of medium size, and are elongated in the direction of the vertical. The temporal fossa is limited above and beneath by a bony arc—an arrangement that is no longer met with except in a single lizard of our own time (*Hatteria*). As in our present reptiles, the teeth, ninety-two in number, replaced one another indefinitely; that is to say, as soon as one was worn out another succeeded it.

The neck is moderately long, and contains ten vertebræ, each of which, excepting the first, bears a pair of small ribs. It must have been very flexible. The trunk consists of 24 vertebræ strongly united by ossified ligaments. The vertebræ, 1 to 17, each bears a pair of strong ribs. The six last

vertebræ of the trunk are soldered so as to form the sacrum, to which is attached the pelvis.

The tail is a little longer than the rest of the body; it is 5 meters in length and contains 51 vertebræ. It is compressed laterally, and reminds us of that of the crocodile. The scapular bones are four in number—two scapulæ and two coracoides.

The fore legs are shorter than the hind ones, and are massive and powerful. Each of them terminates in a five-fingered hand. The first finger, or thumb, is transformed into an enormous spur, which, when covered with horn, must have proved a terrible weapon.

The pelvis contains six bones, to wit: two ilias, two pubes and post-pubes, and two ischia. These latter are remarkable for their elongated form, and, like the other parts of the pelvis, remind us of those of birds. The hind limbs, which, as we have said, are larger and longer than the fore ones, terminate in four fingers.

Several scientists, Mr. Dollo among them, think they have observed traces of webbed feet in the impressions left by the iguanodon in the Wealden formation. Everything, in fact, leads to the belief that these dinosaurs were aquatic in their habits. They must have lived in the midst of swamps and upon the margins of rivers whose waters served them as a place of refuge.

It was Cuvier who, in 1822, determined the first bony remains of the iguanodon. Gedeon Mantell, the author of the discovery, and the one who gave his name to the species, which is smaller than and very different from *I. Bernissartensis*, submitted the teeth to the examination of the illustrious naturalist, and the latter unhesitatingly assigned them to a great herbivorous animal; and he was not deceived, for the diet of the iguanodon was exclusively a vegetable one.

These animals of geological times divided their food with the horny beak in which their jaws ended, and triturated it in the back of the mouth by means of numerous teeth. They thus fattened themselves, and became a prey, notwithstanding their size, to certain great carnivora—for example, to such other dinosaurs (*Megalosaurus*) as were provided with sharp teeth and claws.—*S. Meunier, in La Nature.*

The Electric Light as a Fish Hook.

The United States fish steamer Albatross is fitted with electric lights, and during a recent cruise the experiment was tried of lowering one of them into the sea. Engineer G. W. Baird gives in *Science* the following description of the trial:

Fishermen in nearly all parts of the world use a light in their boats, when fishing at night, to attract fishes into their nets; and it is a common thing for flying-fish to come on board ship at night, if a light be advantageously placed to attract them.

Until incandescent lamps were invented, there were no convenient means of sustaining a light beneath the surface of the water, and there is consequently opened up to us an unexplored field in fishing.

Just what service our submarine lamps will be, we are as yet unable to say; but, with the small lamp which we use from one to ten feet below the surface, amphipods in great numbers, silver-sides, young bluefish, young lobster, squid, and flying-fish have been induced into the nets, and dolphins have approached it; but whether the dolphins were attracted by the light, or were pursuing the squid, Professor Benedict, the naturalist of the ship, was unable to say. Squid are especially susceptible to the influence of light. I am informed by the very eminent authority of Professor Verrill, of Yale College, that a heavy sea, breaking upon a lee shore when the full moon is casting its rays across the land into the sea, will throw hundreds of squid upon the beach in a single night; an evidence of their moving in the direction of the light until caught in the spray and hurled upon the shore.

To succeed in producing the light at considerable depths has been by no means easy.

The Edison Company first prepared a lantern of two thicknesses of glass, hemispherical in form, with its flat side tightly joined to a bronze disk, on which were placed three sixteen-candle power B lamps in multiple arc. At a moderate depth it burned beautifully; but at about a hundred and fifty feet the packing leaked, and, the sea water entering, short-circuited, and the lamp was extinguished by the destruction of the cut-out plug. A similar lamp was then tried with improved packing; but its glass walls were crushed by the pressure of the water, and it was extinguished.

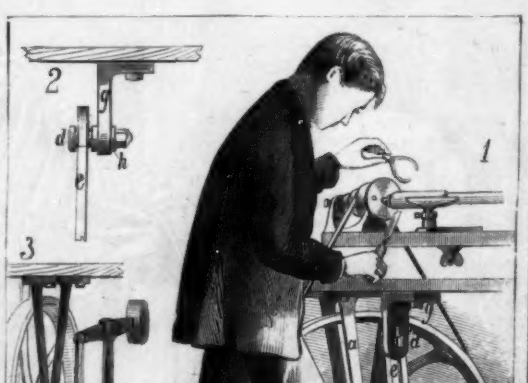
The next essay was with a single Edison lamp, its glass vessel being cylindrical in form, with hemispherical end, to give it strength; its thin platinum wires extending through one end without any external attachment. To these delicate wires I succeeded in soldering the copper wires of the cable, but broke (or cut) off one of the platinum wires at the point where it enters the glass, while putting on the insulation. When it is remembered that a hundred fathoms depth of water brings a pressure of over two hundred and fifty pounds per square inch on the lamp, it will be understood that great care was required in every procedure.

Our next attempt was with a single Edison lamp exactly the same as the last. I succeeded in soldering and insulating the joints perfectly; but the pressure of the water upon the insulation cut the delicate platinum wire on the glass before it had reached a hundred feet in depth.

The Edison Company then produced a lamp in which the platinum wires were soldered to copper wires in a glass cavity, and filled in with resin, so that copper wires, about No. 30 in size, projected from the lamp for our attachment. I coiled the copper wires spirally, and soldered their ends to the ends of the heavy wires of the cable, separating them by a small block of pine wood; this gave some freedom of motion without danger of cutting or breaking the wires. A paper mould was placed round the joint, and filled with warm "gulloot." When this had cooled, it was wrapped with insulation tape and served tightly with twine. This was again covered with gulloot, then tape, and finally with melted gutta-percha; and, when the gutta-percha had cooled, its entire surface was seared over with a hot iron, to make sure of filling any cracks or holes it might contain. The lamp was then lowered into the sea, about seven hundred and fifty feet of cable being paid out, without any indication of failure. To ascertain if the lamp was lighted at all times, we substituted a lamp for the cut-out plug in the deep sea circuit. This brought both lamps in the same circuit, which caused them to glow at about a cherry red instead of a white light; and had any accident happened to break the lamp in the water, or to cause a leak, our upper lamp would have immediately sprung into incandescent whiteness.

FOOT POWER.

This invention is for an improved device for turning the drive wheel of a lathe or any other machine operated by foot power, and is especially adapted to run a watchmaker's or jeweler's lathe. In Fig. 1, which is a perspective view of the device, *c* is a stirrup lever connected with the crank, *b*, of the driving wheel. At the lower end of the lever is the stirrup and at its upper end is a slot, *e*, adapted to receive the bolt, *d*, on which the lever has a vertical motion. A hanger, *g*, attached to the underside of the bench, has a slot in which the bolt, *d*, may be adjusted. The drive wheel is of the ordinary construction and may be adapted for either



DAVIS' FOOT POWER.

a flat or round belt. It is supported on its axle in bearings in the hanger, *a*, which may be bolted to the underside of the bench or to the floor. The stirrup lever has a vertical swinging motion similar to the motion of the foot in walking, thus overcoming the jar to the body experienced in the use of the ordinary forms of treadles. At whatever point the drive wheel may stop it can be readily started by either pressing upon, lifting, pushing, or pulling on the stirrup with the foot. When there is work of drilling or turning requiring more than ordinary power, the bolt, *d*, may be shifted so as to obtain the necessary increase. Fig. 2 is a front elevation of the device. In the modified form, Fig. 3, the beam has a weight on one end for the purpose of counterbalancing the weight of the stirrup rod. In Fig. 1, the rim of the wheel is loaded in casting, opposite the crank pin, for the same purpose, causing the wheel to be evenly balanced and free from jar and to have the regular motion essential to fine work.

This invention has been recently patented by Mr. George Davis, of 1207 Main St., Richmond, Virginia.

Machine Shell Guns.

The *Journal of the Royal United Service Institution* contains the paper on machine guns, by Captain Lord Charles W. D. Beresford, R. N., which was read before the Institute on the 15th of June last. His chief purpose seems to be to show the necessity of providing shell machine guns for the British navy, which thus far is not provided with a single one, its equipment in hand, or contracted for, consisting of 565 Nordenfelt machine guns of 1 inch caliber, throwing a solid steel bullet, 142 Gatlings and 350 Gardiner machine guns, 45 inch rifle caliber, throwing lead bullets. In all classes of vessels the French are better gunned, as not only have they the enormous advantage of breech loaders, but their guns are vastly superior to the English in penetration and rapidity of fire per weight of gun; while to add to the advantages named, the French have mounted in their fleet between 600 and 700 Hotchkiss machine guns, throwing 1 pound shell at the rate of fifteen to twenty a minute. Most of these guns were mounted in position in their fleet before the English had any sort of machine gun whatever, and some were bought as far back as 1875, or three years before the English had any. "It is needless," says Captain Beresford, "to point out the superiority that a machine gun throwing shells would have over the machine gun which only throws bullets, excepting in the case of resisting torpedo-boat attack, when the bullet gun is better. The proportion of machine guns between the two fleets, in another two years, may be about two to one in favor of the French, if the present relative rate of progress is kept up, as they determined two years ago to double the complement of Hotchkiss shell guns to each of their ships. All the French small craft have two or more machine shell guns, whereas the English small craft last year had no machine guns of any description whatever. The French small craft are, however, so vastly superior to ours in fighting capabilities that there could be no doubt as to which would win an action, if two ships of similar tonnage were engaged."

The rain of machine gun shells, as he further shows, will do more to demoralize a ship's company than a few heavy shot or shell striking, passing through, or shrieking over a ship. The French, also, go upon the principle of exposing their machine guns, with a view to getting an all-round and continuous fire; whereas the English prefer protecting the men and guns, and consequently the guns will only bear on a certain small arc. The French give it as their opinion, founded upon actual practice, that the proportion of hits between a barbette and a broadside ship, coming into range, passing at 60 yards, and going on out of range, is three to one in favor of the barbette. Captain Beresford advocates a 2 pound shell gun, and gives it as his opinion that the gun should be a single-barreled gun, so as to be light and easily moved and shifted as wanted; it should have, as far as is possible, an all-round fire, with, perhaps, an umbrella-shaped screen over the men, to keep bullets and shell splinters clear of them, and from under which they can see the enemy from any point of the compass. Men that are hidden won't fight; they must see what is going on to work well, and more particularly with these guns, if they are to be thoroughly effective. Lastly, it is imperative that the man who sights the gun should be able to fire it, as the eye and hand must work together. The 2 pound shell gun is the best sized machine shell gun, as it does not recoil even when on its landing carriage, and it has better penetration than the 2½ pr., and equally good penetration with the 4 pr. tried at Portsmouth, with lower initial velocity, both of which guns are considerably heavier. It penetrated at the Portsmouth trials 2¼ inch iron at 300 yards, and can therefore be relied upon to penetrate unarmored vessels, gun ports, etc., at any angle or range for which it is likely to be required.

The French have given orders to rapidly increase the complement of Hotchkiss shell guns they possess, as they find they are not suitable against torpedo boat attack unless used in large numbers, although they are at the same time trying heavier shell guns of other patterns.

Captain Beresford describes the new Gatling system of feeding as perfect, while he thinks the revolving system and its weight objectionable. He states that the Gatlings have been very serviceable to the British navy. At Alexandria they "came in very usefully for the landing, clearing the town of riot, and restoring order. It was openly stated by Arabi's officers and men that nothing would induce them to face machines that 'pumped lead,' which referred to the Gatling, with which Captain Fisher held the lines with 370 men during four anxious days and nights. Such was the terror inspired by these guns when used for clearing the streets, that although there was an army of over 9,000 men within a short distance, they would not face the small party of 370 men, who held the lines with the Gatling guns."

Combination Tag and Envelope.

This consists of an envelope made of stout paper, open at one end and provided with a flap long enough to reach to the closed end when folded down. The bill is inclosed in the envelope, the address is written upon the face or under side of the flap, and the tag tied to the package by a cord passing through two eyelets—one in the free end of the flap and one in the closed end of the envelope. Although this combination tag and envelope has been in use but a short time, it has given satisfaction to shippers, and proved to be economical.

It was patented in the United States and Canada by Mr. Joseph T. Dunham, and is now being manufactured by Jos. T. Dunham & Co., Pier 24, North River, New York city.

"HUMAN labor," says Dr. Zellner, of Ashville, Ala., "is the most costly factor that enters into the production of cotton, and every consistent means should be adopted to dispense with it." And then the doctor, who has the reputation of having raised some of the finest samples ever grown in the South, describes how, by planting at proper distances, in checks five by three feet apart, one-half of the after labor of cultivating may be saved. About the same amount of plow work is said to be necessary, but not more than one-fourth as much work with the hoe as is required by cotton in drills.

ENGINEERING INVENTIONS.

An improvement in car platforms has been patented by Messrs. Wm. F. Brown and Charles L. Haight, of Poughkeepsie, N. Y. A hook secured to the bottom of the platform projects upward and on the top of the next platform. There are other special devices, but the idea is that cars in collision will be prevented from rising one above the other, and so telescoping.

A car coupling has been patented by Mr. John Cochran, Jr., of Millwood, Mo. It consists of a rock shaft crossing the end of the car from side to side, from whence the coupling pin is suspended by an arm; a link lifter is also suspended from the shaft, so that by cranks at the sides of the car, or a rod and chain extending to the top, the pin and link can be handled without going between the cars.

An improvement in operating valves of steam engines has been patented by Mr. Charles A. Gayne, of Ashland, Pa. It is intended to increase the regularity of pumping, and by it the pump cylinder is completely filled after each stroke. When used with two large pumps, this valve system will stop the pump automatically as soon as the reservoir is emptied of water, whereas other pumps move off rapidly as soon as they begin to take on air.

A safety switch guard has been patented by Mr. Henry Harmer, of Southampton, Ontario, Canada. The switch operating mechanism is contained within a house or structure, into which the switchman must enter to adjust the switch, but which he cannot leave until, after connecting a switch with a siding, he has reconnected it with the main line; and this invention provides special means for accomplishing this end.

An improved boiler feeder has been patented by Mr. John H. Phillips, of New York city. It is a pump connected with a vessel for receiving water, the latter having a float to throw a lever connected with the slide valve, so the pump will be started as soon as the water in the receiver reaches a certain height. The feeder may be placed at a distance from the boiler, and above or below the water line, and will return all condensed water formed under any head or pressure.

An improved steam boiler has been patented by Mr. Willey J. P. Kingsley, of Rome, N. Y. The tubes which enter the fire box conduct the heat products to the top of the boiler as usual, but there are return tubes between the inner ones and the boiler shell, which extend down through a water leg, and thence lead between the shell and the inclosing wall to the smoke stack, thus greatly increasing the run of the heat along the boiler, and more than doubling the heating surface.

A car coupling has been patented by Messrs. Joseph K. Nyce and Irwin C. Hunsicker, of Skippack, Pa. It provides for a drawhead with longitudinal slots in the sides and bottom, in which side slots a cross bar slides, which has a bottom guide projection into the bottom slot. The ends of the cross piece are adapted to strike against the lower ends of bail-shaped frames pivoted on the drawhead and throw them over hooks on the opposite drawheads, thus automatically coupling them.

An improved automatic car coupling has been patented by Mr. Adoniram J. Chapel, of Arkansas City, Kas. Upon one side of the forward end of each drawhead is formed a projection, the forward end of which is beveled to cause it to enter a recess formed in the other side of each drawhead. The recess is rectangular, and so also is the coupling pin and the hole in which it slides, the upper part thereof being in such position that one-half will be over the recess and the other half in the solid body of the drawhead. The device is intended for both passenger and freight cars.

A patent for an improved steam boiler has been issued to Mr. Albert C. Blatchley, as administrator for Mr. Albert P. Blatchley, deceased, of Deposit, N.Y. This invention relates to sectional boilers, and consists of a special construction of the deflecting plates for effective water circulation, and in the means of securing the same in the end chambers of the boiler, which are connected by longitudinally arranged steam pipes or tubes. There is also a special construction of the side casings to allow of convenient access for cleaning the tubes.

MECHANICAL INVENTIONS.

An improved treadle power has been patented by Mr. Arthur W. Bush, of Boulder, Cal. A pair of reversely acting pawl arms, and a branching or double connecting rod are so arranged that the dead centers of the crank are avoided, and the stroke of the treadle may be varied at the will of the operator.

A coal and rock drilling machine has been patented by Mr. Thomas Aitken, of Pittston, Pa. The invention consists in an improved means for securing the bar or post which carries the swivel and drill rod, and such construction saves the necessity of a set screw, which is liable to be lost or mislaid.

An improved screw machine has been patented by Mr. Georg Heyne, of Offenbach-on-the-Main, Germany. The invention covers various combinations of devices for holding, feeding, and cutting the rods or other pieces from which the articles are to be made. It makes an apparently complicated piece of mechanism, but works simply and almost automatically.

A tire tightener has been patented by Mr. Harvey B. May, of Oregon City, Ore. The wheel rim is stretched by a screw jack device between the hub and the rim, and there are attachments to hold the spokes in the hub, preventing them from being drawn out of their sockets when the rim is stretched, and so they may be thereafter as firmly fixed as ever.

An improvement in water wheels has been patented by Mr. Lorenzo B. Swartwout, of Three Rivers, Mich. The buckets are not cylindrical, but have an inverted bell shape, and the lower ends of the partition walls are concaved, or inclined in the reverse direction of that in which the wheel is to rotate. Each bucket is beveled at the outer end, so the beveled parts of the bucket walls are at right angles to the fixed wings in the throat in the curb of the wheel.

A machine for curling hat brims has been patented by Mr. John Wilson, of Newark, N. J. This machine presents a new combination of parts in an apparatus for turning over the edges or curling the brims of hard felt hats before shaping them. By its use the sides or crown of the hat or its lining are not exposed to any injurious effects of the escaping steam, and there is no necessity for any adjustable interior hub clamping device, the brim of the hat being held down to its place on the steam by a hollow weight, cover, or shield.

An improved machine for shelling green peas and beans has been patented by Mr. Giuseppe Paci, of New York city. The peas or beans to be shelled are placed in a hopper, and the machine is operated by turning a crank handle, when the top, or cover, of the machine, to the underside of which is affixed a ring or disk, pressed down by spiral springs, is turned in one direction, and a suitable screen is revolved in an opposite direction. There are special devices for conveying the peas or beans into hoppers or receivers according to their size, the pods being discharged from the machine, and a current of air from a blower carries off the fine particles.

A cartridge loading machine has been patented by Mr. Frederick A. Winter, of Thomson, Ga. An intermittingly rotating disk has cells for holding the cartridge shells combined with a novel feeding device for shifting it around as the cartridges are charged; also a device for pressing in the wads and bullets, with attachments for crimping when paper cartridges are used; also attachments for capping and uncapping, and one for holding the powder and shot flasks in connection with the cartridge holding disk.

AGRICULTURAL INVENTIONS.

An improved check row corn planter has been patented by Mr. Walter W. Church, of Carthage, Mo. The check marker shaft is made to revolve continuously; it has arms with crotched ends sufficiently long and deep in the crotch to enable the shaft to be turned a quarter revolution by one arm, so that continuous rotation will be had with four arms, one arm being engaged while another is disengaged. By this contrivance also the motion for the dropper slide may be had from the check marker shaft.

A combined harrow and cultivator has been patented by Mr. Lewis A. John, of Dunlap, Kas. The object is to make an implement that will be simple, strong, durable, and easily handled, for use in tilling the soil around corn, cotton, and other standing crops. The plows may be swung freely, by the handles, to either side, or closer together or farther apart, as the crop may require, or be lowered or raised vertically for different conditions of crop or soil, enabling the workman to heap up about the plants just the right quantity of earth, which has been previously loosened by the harrow.

A grain header has been patented by Mr. John A. Rumrill, of Salina, Kas. In an endless sickle contrivance the sections are linked together suitably for running on a drum, with guides to take up the slack, means for operating, and an extension carrier for delivering the grain from the elevator to a wagon alongside of the header. The continuous movement of the sickle in one direction is calculated to make it cut better and easier than the reciprocating sickles.

An improvement in steam plows, to increase the traction and facilitate the steering, has been patented by Mr. Francis Pidgeon, of Saugerties, N. Y. The plow frame can be propelled forward or backward. There are sets of plows at each end of the frame, and the plows at the forward end are lifted from the ground as the plow advances; the wheels on either side are operated independently of the wheels on the other side by separate pistons and cylinders. Bars on the sides worked by a chain around an upright shaft, allow of one side or the other of the frame to be readily advanced to facilitate turning.

MISCELLANEOUS INVENTIONS.

A fire escape has been patented by Mr. William Wightman, of Denver, Col., which prescribes the construction of vertical chambers within the building walls, each chamber connecting with a separate story and at the bottom with the outside of the building.

An improved wrench has been patented by Mr. James Davidson, of Central City, Colo. It is a socket wrench provided with expansion jaws, and a loose sleeve to contract the jaws upon the nut or article, so as not to wear the angles of a nut or cock when applied, the clamps being made to gripe tightly.

A music holder has been patented by Mr. William R. Hoffman, of Oregon, Mo. It consists in a combination, with opening and closing music holders, made to shut and keep closed by a spring applied to a clamping and pivoted section or clamp, of an attached catch for holding the holder open, whereby great facility is afforded for putting in and taking out the music.

An improved twine holder and lifter has been patented by Mr. A. B. Tomlin, of Fort Collins, Colo. In combination with a twine holder is a pivoted ring with one part weighted, and a rod or wire projecting from the part opposite the weighted part, this rod or wire being provided with a loop or eye for lifting or raising the free end of the twine, so it will be out of the way when not in use, but can be easily reached.

A tobacco cutter, or pocket tobacco receptacle and cutter, has been patented by Mr. Joseph W. Cooel, of Rockland, Me. It is for cutting plug tobacco for the use of smokers. The plug may be placed within a box of size adapted to hold an ordinary plug, and then, by turning a cap, one set of cutters shaves off the tobacco, while other cutters working in a cross direction divide it up finely, and it drops in the cap provided therefor.

A glass butter jar, box, and cover has been patented by Mr. William W. Weston, of Honesdale, Pa. A glass jar is placed in a box with suitable packing, the jar having a wooden or glass cover on which a diagonal crosspiece rests, through the ends of which screw-threaded rods pass, which are secured in the bottom of the box, thus holding the cover firmly on and the jar in place in the box.

An improvement in fireproof floors and ceilings has been patented by Mr. Andrew J. Campbell, of New York city. A joggle arch is used in which are three pieces, the floor beams, struts, and joggle pieces, the struts preferably hollow to save weight, and all of fireproof material. The floor is inexpensive, as the pieces can readily be moulded, and platforms or centering are not necessary in their erection.

An improved inside window shutter or blind has been patented by Mr. William Teutsberg, of Omaha, Neb. This invention relates to inside window shutters or blinds adapted to be raised and lowered by means of cords. It is a simple and cheap arrangement whereby slats, as provided, may be raised or lowered to any desired position, or the angle of the slats be changed at pleasure.

An improvement in watch bows has been patented by Mr. Rome B. Richmond, of Macon, Ill. It consists of a watch case or locket pendant with a hook above or below the bow aperture on each side, combined with a bow having a semicircular or eccentric transverse ridge a short distance from each end. No screw is required to hold the bow in place, and the construction is simple and durable.

An improved rag joining knife has been patented by Mr. James A. Fulwiler, of Lexington, Ill. The blade is sharpened at one end, and has an inclined notch passing toward the point of the knife from the blunt back, for engaging the rags and drawing one through the other in forming the loop or joint, the slot being so arranged in relation to the sharp point and edge as to join the rags firmly and smoothly, with but short ends.

A combined copy holder and book rest has been patented by Mr. Gustave Weinschenk, of Cambridge, Mass. The device includes a clamp with proper attachments, so that, when fastened to a desk or chair it will hold books or manuscripts open for perusal; it is so arranged as to accommodate a greater or less thickness of a book or manuscript, and has a line bar, or marker, making it especially desirable for holding the compositor's copy in type setting.

An improved flood fence has been patented by Mr. Henry D. Merrill, of Springfield, Ill. It is constructed with mud sills staked to the bottom of the stream, and connected at their down stream ends by pairs of posts, with upwardly inclined down stream ends of break bars, the fence to turn down into a horizontal position to allow ice, logs, and other rubbish to pass over, and the fence to return to an erect position as soon as the water subsides.

An improved bag holder, for keeping a bag open while it is being filled, has been patented by Mr. Daniel F. Smith, of Republic, O. By a suitable arrangement of standards in connection with a platform, levers, and cross bars, the bag is supported and held open by an elongated elliptical spring band or hoop. This spring band or hoop may be locked in position, but when the bag is filled the free ends thereof are drawn together and the bag will be released.

Mr. Washington I. Lee, of Peekskill, N. Y., has patented an improved baking pan, for baking bread, meats, etc., in a more perfect manner. The pan is of sheet iron in the usual shape, and to the bottom and ends a sheet iron strip or thin cast iron plate is riveted, to support the pan so that the bottom will not come in contact with the hot stove plate and the contents of the pan will not be burned. A specially contrived and supported hinged cover is also provided for.

A yellow coloring matter which dyes a very bright yellow, has been patented by Mr. Ivan Levinstein, of Manchester, Eng. It is made by the action of nitric acid upon the mono and disulpho acids of nitroso-alpha-naphthol, or upon a mixture of the same, whereby, according to a specific process, a yellow precipitate is formed resembling earthy lumps; it can be pulverized by pressing between the fingers, is odorless, and has distinguishing acid properties.

An improved butter tub has been patented by Mr. Henry F. Coombs, of Charlottetown, Prince Edward Island, Can. The staves are thicker at one end than the other, and narrower at the thin end than at the thick on one face; and wider at the thin end than at the thick on the other face, the tub is smaller at the top than at the bottom outside, and larger at the top than at the bottom inside, so the tub cannot lose its hoops by their dropping off at the bottom, and the butter may be removed in bulk in the usual way.

A cutter and holder for fruits and flowers has been patented by Mr. Peter McDonald, of Yonkers, N. Y. To the upper end of a pole of desired length is fixed a concaved sharp edged blade; to the shank of this blade is pivoted another, and to the rear of both are projecting plates or lugs, with rubber blocks extending to near the cutting edges, so that when the blades are brought together to cut the stems of fruit or flowers, the rubber blocks will grasp and hold the same until lowered.

An improved water heater has been patented by Mr. John B. Webster, of Los Angeles, Cal. It is intended to be principally an oil burner, and around the water chamber are suitable flues to facilitate obtaining the utmost heat. The reservoir is suitably connected with, but removed from the burner. The whole apparatus is constructed of sheet metal, with tight joints, and is intended to furnish a portable heater which can be readily used for heating water out of doors or wherever wanted.

An improvement in transplanting implements, designed to facilitate the handling and resetting of plants, has been patented by Mr. Frederick Visscher, of Mount Sterling, Ky. A half conical bowl or vessel, that may be opened across its center by two handles or levers, is designed to hold the plants; at the bottom is a downwardly tapering root receptacle, forming a pintle or prong projecting from the bottom of the bowl. The plant, placed in the bowl, with its roots thus surrounded, the implement can readily be forced into the soil to the depth desired, and then the parts of the bowl and pintle be readily separated and withdrawn by means of the handles.

A transplanting implement has been patented by Mr. Frederick Visscher, of Mount Sterling, Ky. This invention is designed to facilitate packing the earth around plants that have been transplanted, and where the earth lies loosely around the roots. Two handles are so pivoted as to form levers, at the lower ends of which are semicircular frames holding teeth; these, when opened, are to be forced into the ground around the plant, and as the handles are drawn together they pack the earth around the roots of the plant.

An improved cupelling furnace has been patented by Mr. Bernhard Roesing, of Friedrichshutte, Upper Silesia, Germany. Instead of the ordinary porous material of which these are made for drawing off the inferior metals, the inventor substitutes a firm metallic cupel, to which motion can be readily communicated as desired, without interrupting the process of cupellation, and the products of oxidation—litharge, etc.—may be withdrawn, absorption in any degree not being intended. The cupel is covered with a lining of refractory material, to avoid overheating of the cupel or too great cooling off of the molten lead.

NEW BOOKS AND PUBLICATIONS.

HOW TO MAKE CANDY, N. P. Fletcher & Co., Hartford, Conn.

A manual of plain directions for the manufacture of the more popular forms of confectionery.

A PROSPEROUS PERIODICAL.

The special illustrated edition of *Building* for November is a noteworthy specimen of the result attending well directed effort in the newspaper line. Although this journal has only reached No. 2, vol ii., it has passed the experimental stage and now stands on a firm basis. It is devoted to architecture, as its title implies, and in its editorial and general columns treats pertinent subjects in an instructive manner, aiding its explanations by attractive illustrations. It is published by William T. Comstock, 6 Astor Place, this city.

EXPLOSIVE MATERIALS. A series of lectures before the College de France, at Paris, by M. P. E. Berthelot, "Science Series," D. Van Nostrand & Co., New York.

This little book, the work of translating which from the French has been done by Marcus Benjamin, Ph.B., F.C.S., notes the constitution, explains the action, and marks the differences between the leading kinds of explosives, more particularly those which have come into prominence during the past twenty years for industrial purposes. The lecturer comes to his subject as an accomplished chemist, but the language is free from technicalities, and the explanations cannot fail to be readily understood by any one of ordinary intelligence. In regard to dynamite, gun cotton, nitroglycerine, strong and slow powders and strong and rapid powders, the results of many experiments are detailed, developing facts concerning their operation which are not readily susceptible of demonstration in the ordinary uses of these explosives. In addition to the above the book contains a short historical sketch of gunpowder, translated from the German of Karl Braun, and a valuable bibliography, or list of works relating to the constitution and preparation of explosive substances.

MECHANICS OF ENGINEERING AND OF MACHINERY. By Dr. Julius Weisbach. Revised and enlarged by Gustav Herrmann. Translated by J. F. Klein, D.E. Illustrated. Vol. III. John Wiley & Sons. Price $5.00.

This book is part I, section I, of volume iii., and treats of the Mechanics of the Machinery of Transmission. The remaining two parts will treat of the Mechanics of Machinery for lifting and transporting solid and fluid materials and for changing the form and size of materials. The introduction is a thorough and practical discussion of kinematics. The first chapter considers journals, shafting, couplings and bearings, giving the various forms, relative dimensions, etc., and discussing friction and lubricants and lubricators. The second chapter is on gearing, every form of which is treated, while the remaining chapter considers rods and their guides. It is impossible, in a notice of this kind, to convey any idea of the scope of this work; it would be difficult to find a problem properly coming within its province that is not fully explained. The book has been a recognized authority for years, and is specially designed as a text book for technical schools and colleges and for the use of engineers.

GRAPHIC AND ANALYTIC STATICS IN THEORY AND COMPARISON. By Robert Hudson Graham, C.E. Crosby, Lockwood & Co., London.

The book aims to place the theory and relations of graphic and analytic statics in a clear light and to show their practical application to the treatment of stress in common forms of iron and wooden frameworks. The fundamental principles of graphic statics are treated in Part I., each proposition being proved, step by step, by the sole aid of geometry, no serious gaps being consciously left in the demonstrations. Part II. deals with the dual treatment of roof and bridge structures by graphic and analytic methods. A special feature of this part is the treatment of a given roof or bridge by two methods which mutually check each other. The roof or bridge is taken truss by truss, and the reciprocal diagrams given in separate form, of the independent trusses. The same framework is then treated as a whole. One article explains the graphic and analytical methods of sections in application to the same example. Part III. shows the graphic and analytic treatment of direct stress; extension under stress; resultants and centers of stress; centers of gravity; moments of all kinds and straight beams and girders of various forms both in a state of equilibrium and under loads. At the end of each chapter there is a set of practical problems. The last chapter is devoted to wind pressure, giving the general theory, velocity and pressure, and action on roofs and braced piers.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at the office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their indentification.

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(1) G. H. W. asks: Will you kindly answer the following questions through your Notes and Queries column? 1. Will the dynamo described in SUPPLEMENT, No. 161, work two of Edison's smallest incandescent lamps if the magnets are excited by a strong battery? A. Yes. 2. What kind of cast iron should the armature of the dynamo be made of? Will ordinary cast iron do? A. Soft gray iron. 3. Will No. 19 copper wire be too small to make the connections with the lamps? If too small, what size should be used? A. No. 14 or 16 would be better.

(2) J. G. R. writes: I have a set of yellow clarinets that I wish to stain black. Can you tell me of anything that will do it? A. Mix up a stain of iron sulphate (or copperas) and logwood, to which add powdered nutgall; dry, rub well, polish with a shellac varnish ground with bone black.

(3) S. H. H. writes: I have seen in the SCIENTIFIC AMERICAN articles about compressed lime for blasting. Can you inform me where it is to be had? A. Use ordinary lime; press it tightly into the opening, and then moisten it. Its expansion will cause the blast.

(4) F. J. P. asks whether there is any fluid or substance which when it touches paper will eat the paper away just where the fluid or substance comes in contact with it. A. Caustic potash or concentrated sulphuric acid will probably accomplish your purpose.

(5) L. L. asks the best way to prepare diamond cement for repairing cracks in a cistern. A. On page 2110 of SCIENTIFIC AMERICAN SUPPLEMENT, No. 133, are given the directions for preparing several varieties of cement which we think you will find as good if not better than diamond cement for the purpose mentioned. Diamond cement as described by Dr. Ure consists of isinglass, 1 ounce; distilled water, 6 ounces; boil to 3 ounces, and add rectified spirit, 1½ ounces; boil for a minute or two, strain, and add while hot first a milky emulsion of ammoniac half an ounce and then tincture of mastic 5 drachms.

(6) C. W. writes: The river at this place is a mountain stream having a fall of from 14 to 20 feet per mile, but is free from cataracts; it is about 100 feet wide and of sufficient depth for a light draught steamer such as is described on page 133 of your Reference Book. What I wish to know is this: 1. Can a steamer of this description navigate such a stream when not drawing more than 12 inches of water? A. You do not give the velocity of steamer, but we think from the grade, or fall, it must be too great to work a steamboat against it successfully. 2. Which would be the best for such a boat—a stern wheel or a propeller? A. Stern wheel boat the only one that would succeed. 3. What would be the weight of such an engine and boiler as you describe? A. The boat must have large power; the weight would of course depend upon the size of the boat and power.

(7) J. C. W. asks: 1. Cannot water be elevated with less power by chain elevators than by pumps? A. We don't think your chain buckets will require less power than a pump. 2. Can chain elevators be made sufficient to carry buckets 4 feet long containing 2 cubic feet to the bucket, the buckets being as close to each other as they can work, and deposit in a box on a perpendicular, or will they have to be on an incline? The box will be so arranged that the buckets can go over them and will be 40 feet high. About 65 buckets will be deposited per minute. Will this not be cheaper than a pump, and easier to be driven? If so, how much power will it take to run same? A. If the buckets and box are properly shaped the buckets will deliver with some waste, but there should be an additional box between the two lines of buckets to catch the water that may spill or waste from the buckets when going over the top shaft. It will require 12 to 13 horse power.

(8) W. S. C. asks (1) where a tightener should be placed on a belt—near the small or drive pulley? A. Near the small pulley, as it will give more surface for belt to act upon, and the large pulley has already much the most surface. 2. Mill men differ about the same. Therefore I wish to get your opinion; at the same time will you be so kind as to give as simple a rule as possible for finding the horse power of steam engines? A. For rule for ascertaining horse power, see SCIENTIFIC AMERICAN SUPPLEMENT, No. 253.

(9) E. T. H. writes: You give a recipe for marking ink (I have lost the reference) of shellac 2 ounces, borax 2 ounces, water 25 ounces, gum arabic 2 ounces, and Venetian red. Could you give me a modification which would make it suitable for marking through stencil plates, for which this is too thin? Have tried your liquid stove polish, and find it first rate, but very hard to polish. Is it likely that the sugar is in excess? A. 1. By adding glycerine to a suitable consistency, you will obtain an ink which will probably answer your purpose. 2. As you give no proportions, your question cannot be satisfactorily answered. The proper amounts are:

Black lead pulverized	1 pound.
Turpentine	1 gill.
Water	1 gill.
Sugar	1 ounce.

(10) W. J. P. asks: Will a balance wheel run as easily close to the floor under a machine as above it? A. There should be no appreciable difference.

(11) C. R. S. asks: What is the best method or way to "lay up" a tubular boiler—horizontal—when not in use, say six months at a time? A. Fill entirely with fresh water, adding a little lime, and close up tight. Clean outside, remove all masonry which touches the boiler, and oil with fish oil. Close opening to chimney, so there will be no draught through it.

(12) C. E. L. writes: 1. Watson says in his work on the modern practice of American machinists and engineers, that the steamboat John Faron on the North River had boilers made to use the fuel inside the water space of boiler. How did they have it fired so as to be able to burn the fuel? A. The furnaces were made tight and strong, air forced into fire under a pressure, a little more than the pressure of steam in the boiler; all the gases, etc., of combustion thus forced through a valve into the boiler, fired through valves. 2. Would you use an ordinary steam engine for compressed air, or would you have to have one made to run by air? A. Steam engine. 3. How large a reservoir would be necessary for about 4 horse power? Could it not be made of cast iron? A. Should be wrought iron. Could not determine size without knowing the length of time through which it is to work 4 horse power.

(13) O. J. L. asks: Can the ordinary water white 150° fire test coal oil be changed in color to an indigo blue or any other shade of blue without lowering the fire test? If it can be done, by what method is it accomplished? A. The fire test will not be affected by the adding of suitable dye, such as an aniline color, of the desired shade to the oil. Of course, one must be selected that is soluble in petroleum.

(14) J. A. T. writes: 1. How can I make a liquid for stripping silver from old plated ware? A. Use nitric acid to dissolve the silver. 2. How can I recover the silver from the stripping liquid? A. The nitric acid solution containing the silver is treated with a salt solution; the metal is then thrown down as the chloride in the form of a white powder. This is collected and fused with borax in a crucible, and then the silver will be obtained in its metallic form. 3. How can I make an induction coil for an electric machine? A. Consult article on "Induction Coils" in SCIENTIFIC AMERICAN SUPPLEMENT, No. 160. 4. Will the stripping liquid for silver answer the same purpose for gold plate? A. Use aqua regia or nitrohydrochloric acid to dissolve the gold.

(15) D. H. asks: What is the best thing to prevent glucose made from corn from coloring under heat? A. We know of nothing that will prevent the sugar coloring when heated. The best way in which to avoid the coloring is by boiling it as quickly as possible in a vacuum at a temperature of 125° Fah. If in an open pan, boil with steam. A certain amount of coloring is sure to be developed.

(16) O. S. D asks: 1. Will a boiler 42 inches in diameter and 60 inches high run two cylinders 7x10 to the capacity of 14 horse power, 120 2-inch flues 3 feet long? A. If your boiler has a good draught, it should furnish 14 horse power without trouble. 2. What is traction resistance of 4 wheels 6 inches face 4 feet in diameter? They have movable lugs, that project through the face or rim of wheel, 3 inches wide and 2 inches deep. Will the resistance be as much as four 16 inch plows plowing 5 inches deep? A. The traction will in a measure depend upon the weight carried by the wheels, but for working an ordinary soil we think your wheels have not more than half the force they should have, and the lugs should also be increased in proportion. We cannot tell what power four 16 inch plows require, for different kinds of soil.

(17) G. W. D. writes: I am using a No. 9 Sturtevant fan blower. Can it be run too fast, so that it will not blow as hard as it would if run at a slower speed? What size engine should I use to get the best results from this fan, for glass manufacturing purposes? A. Your No. 9 Sturtevant blower at a speed of 1,085 turns per minute will deliver 4,320 cubic feet of air per minute, under a pressure of 4 ounces, requiring 6 horse power. At 1,250 turns per minute it will deliver 5,340 cubic feet of air at a pressure of 4 ounces, requiring 11 horse power. At 1,416 turns, 6,180 cubic feet, requiring 17 horse power, and so on. There is no speed that you can give the blower that it will not do its proportional duty. If it ceases to blow or deliver air at high speeds, it is because of obstruction, possibly at the tuyere.

(18) J. C. H.—It is rather a difficult undertaking to choose a trade for a person that is a perfect stranger to us in his capabilities, habits, and previous employment. If you have a fancy for any particular calling, we should say that that is the trade you ought to follow. The employment of a machinist is probably as lucrative and steady as any trade that we know of, and is a leader to many other callings that may take you on to success. Of course you will probably have to begin at the bottom and do a great deal of drudgery, but if you are a wide awake man and have your eyes open to the things that are being made around you, and make the interest of your employer your own, the chances are entirely in your favor for quick advancement. Strike in at the nearest machine shop, a small one if possible; take any wages that you can get, do not be particular, get to work, and you will get ahead.

(19) D. D. L. asks: What will best remove smoke from the sheets of mica commonly used in heating stoves, and leave the surface clear? A. We doubt whether mica can be cleaned after it has been exposed to the smoke of a stove, other than by washing with warm soap suds and wiping. The pyroligneous acid of the smoke makes new compounds with the surface layers of the mica. The mica being composed of silica, alumina, magnesia, and potash, will not resist heat or acids strong enough to destroy the carbon or its coloring matter without making the mica opaque or otherwise destroying its texture.

(20) M. M. B. (62) November 10 concerning treatment of seal skins.—M. C. H. writes us that a large business is now done in Brooklyn, N. Y., in curing, dyeing, and improving seal skins, the work done being equal to the best imported work.

(21) J. A. C. writes: Suppose we have two cylinders of the same size. In one cylinder there are two pistons working together, at the center, and the cylinder with one piston working from end to end; which engine would have the most power—the one with the single piston or the one with the double piston? Or would they both have the same power? Steam pressure the same on both cylinders. A. The one with single piston would have more power, as there would be less loss from radiation, clearances, and friction.

(22) F. T. J. writes: I have a small engine cylinder 2 inches by 4 inches that I work at about 50 pounds boiler pressure; boiler has about 20 or 25 feet heating surface, perhaps more. I want to do away with steam on account of the fire. Can I pump air into the boiler (to insure steady running of engine) by hand, and work engine at same pressure, and obtain same power as by the use of steam? A. No, your power would be limited to the power of the man pumping in the air. We think a small turbine, taking water from your water works, would be the most convenient and economical power for you.

(23) G. B. F. asks: What is the cause of knocking in an engine? Is it not a defect or fault that should be remedied at the earliest notice? A. There are many causes—bad set of valves, loose journals or piston, water in cylinder, no clearance, etc. The cause should be ascertained and remedied, otherwise it may lead to an accident.

(24) R. J. H. asks for a recipe for removing printer's ink from nicely finished book paper; he wishes to remove some figures from a catalogue. A. Printer's ink is soluble in ether, oil of turpentine, and benzine. Washing with warm caustic lyes is also recommended. Bleaching agents are also stated to accomplish this object, but we do not put much faith in any of these agents.

(25) A. M. V. asks (1) for a receipt for sensitive ink. I would like one (if possible) which is developed in some other manner than by heat, and which after being developed will disappear in a short time, until redeveloped. A. On page 2498 of SCIENTIFIC AMERICAN SUPPLEMENT, No. 157, will be found a number of receipts for various colored sensitive inks. 2. A receipt for an ink, to be used with a rubber stamp, which will not wash out of clothes. A. Crystallized aniline black, half an ounce, in pure alcohol, 15 ounces, and adding concentrated glycerine, 11 ounces, to the solution. This liquid is poured upon the cushion and rubbed with a brush.

(26) W. C. D. asks what is the safest lamp. Glass flies or bursts, and metals corrode. In other words, how can we use oil to illuminate our homes and be safe? A. The best fire test refined kerosene oil in a student lamp is one of the safest lamps that we know of. Our better class of ordinary kerosene lamps with fair care are considered safe. If you reject all oil that does not stand 150° fire test, you will be very safe with the better class of kerosene burners with chimneys.

(27) A. E. D. asks whether the wood called "Spanish cedar" would make a good body for a violin. A. The body of violins is usually made of straight grained deal. 2. Is there any solution which will make white cows' horns become clear, the horns to be used for making powder horns? A. Boil the horns in a dilute solution of caustic alkali.

(28) E. A. W. asks how to mix quicksilver (mercury) so as to make a thin solution of it to rub on metal. A. The amalgam of silver commonly used is prepared by putting one part of silver in a small saucepan or ladle which is perfectly clean, and then adding eight parts of quicksilver and gently heating until the silver is dissolved. Agitate the mixture for a minute with a smooth iron stirrer and pour it out on a clean plate or stone slab. When cold it is ready for use. A saturated solution of mercury dissolved in nitric acid is also used for this purpose.

(29) J. H. writes: 1. My wife is accustomed to make her own soap for family use, from old fat, lye, soda, and salt. It is very good, but never seems to get really hard. It is always soft and pulpy. Please to inform me what will harden it. A. A good way to make soft soap hard is as follows: Put into a kettle four pailfuls of soft soap, and stir in it, by degrees, about one quart of common salt. Boil until all the water is separated from the curd, remove the fire from the kettle, and draw off the water with a siphon (a yard or so of India-rubber tubing will answer); then pour the soap into a wooden form in which muslin has been placed. When the soap is firm turn it out to dry, cut into bars with a brass wire, and let it harden. A little powdered resin will assist the soap to harden and give yellow color. If the soft soap is very thin, more salt must be used. 2. What is good to clean tableware that has been nickel plated, and the plate is worn off and looks quite brassy? A. We should think that it would be best to renickel the articles.

(30) J. M. describes a machine and process of amalgamating and separating silver from the ores, and asks: 1. If I can use other cheaper salt than sulphate of copper that gives the same good results. (Lead amalgam does not work well with some kinds of ores.) If there is any other, please tell me how to prepare it and how to use it. A. There is no salt that can be used that is cheaper than the copper sulphate. 2. How can I retake the flour mercury and make it useful again, or how can I avoid the mercury taking this form in the barrels? A. We would recommend that the flour mercury be redistilled, and that the metal be covered with a layer of clean iron filings or turnings to the extent of one-sixth its weight. Then carefully heated and the mercury collected in water, treated with a little hydrochloric acid, and finally washed with water and dried at a gentle heat.

(31) C. J. W. asks: 1. Have antimony and bismuth a metallic ring like brass? A. Antimony and bismuth have more or less of a ring, but on account of their brittleness they are seldom made into forms where the ring would be noticed. 2. How do their weights compare with that of gold? A. The specific gravity of gold is 19·36, of antimony, 6·71, of bismuth 9·82. 3. How does quicksilver weigh with gold. Is it much lighter? A. The specific gravity of mercury is 13·59. 4. Where can I get a book on photo engraving? A. See SCIENTIFIC AMERICAN SUPPLEMENTS 82, 213, 143, 146, and 227 for Photographic Engraving Processes, and see advertising columns.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

W. R. S.—The samples do not contain copper or nickel except in possibly small amounts, and in order to definitely prove the presence of either; they would have to be analyzed, the expense of which would be $5 each. From our examination we believe the specimens to be one of the varieties of pyroxene or epidote. The latter is frequently found in connection with the copper at Lake Superior.—G. B. F.—The specimen is a clay, or silicate of aluminum. Its value can only be determined by analysis. The latter would cost $15.00.—J. C. R.—It is impossible to form a definite opinion of the value of the clay unless a chemical analysis be made, which would probably cost $15.00 to $25.00.—C. J. V.—The specimen is nickeliferous iron pyrites. Its value depends upon the amount of nickel that it contains; and as the extraction of the latter is an expensive operation, the value of the ore is reduced accordingly.—T. H. S.—The sample is what is know as turba, or turfa, and is a clay impregnated with bitumen. It has been described in Dr. Hartt's book on Brazil.—P. J. F.—Sample No. 1 is a slate, such as is generally found in coal measures, but does not necessarily imply the presence of any great amount of coal. No. 2 is a black mica in a silicious rock.—C. N. N.—These five samples are simply a series of clays whose color depends upon the metallic oxides with which they are colored. The yellow and red shades are due to oxide of iron.—H. A. B.—The sample is pyrite (iron sulphide), and may carry gold. To determine the latter, an assay costing $5.00 would be necessary.—W. R. A.—The sample is pyrite (iron sulphide), and may carry gold. To determine the latter an assay costing $5.00 would be necessary.

ERRATUM.—J. H. W. In answer to Query (8) December 1, 1883, gallon should read cubic foot.

Business and Personal.

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December 4, 1883.

AND EACH BEARING THAT DATE.

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